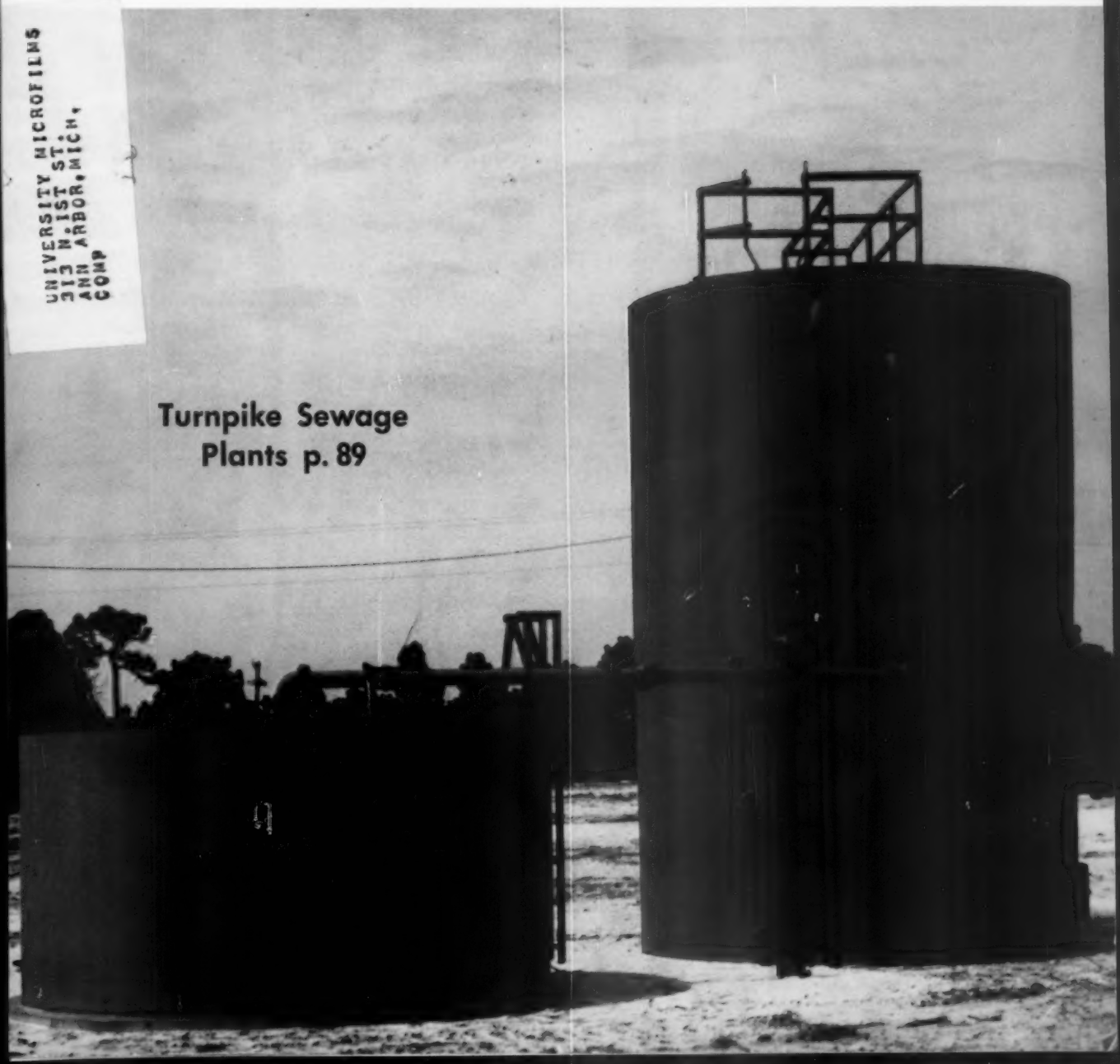
A Scranton Gillette Publication

MARCH 1960

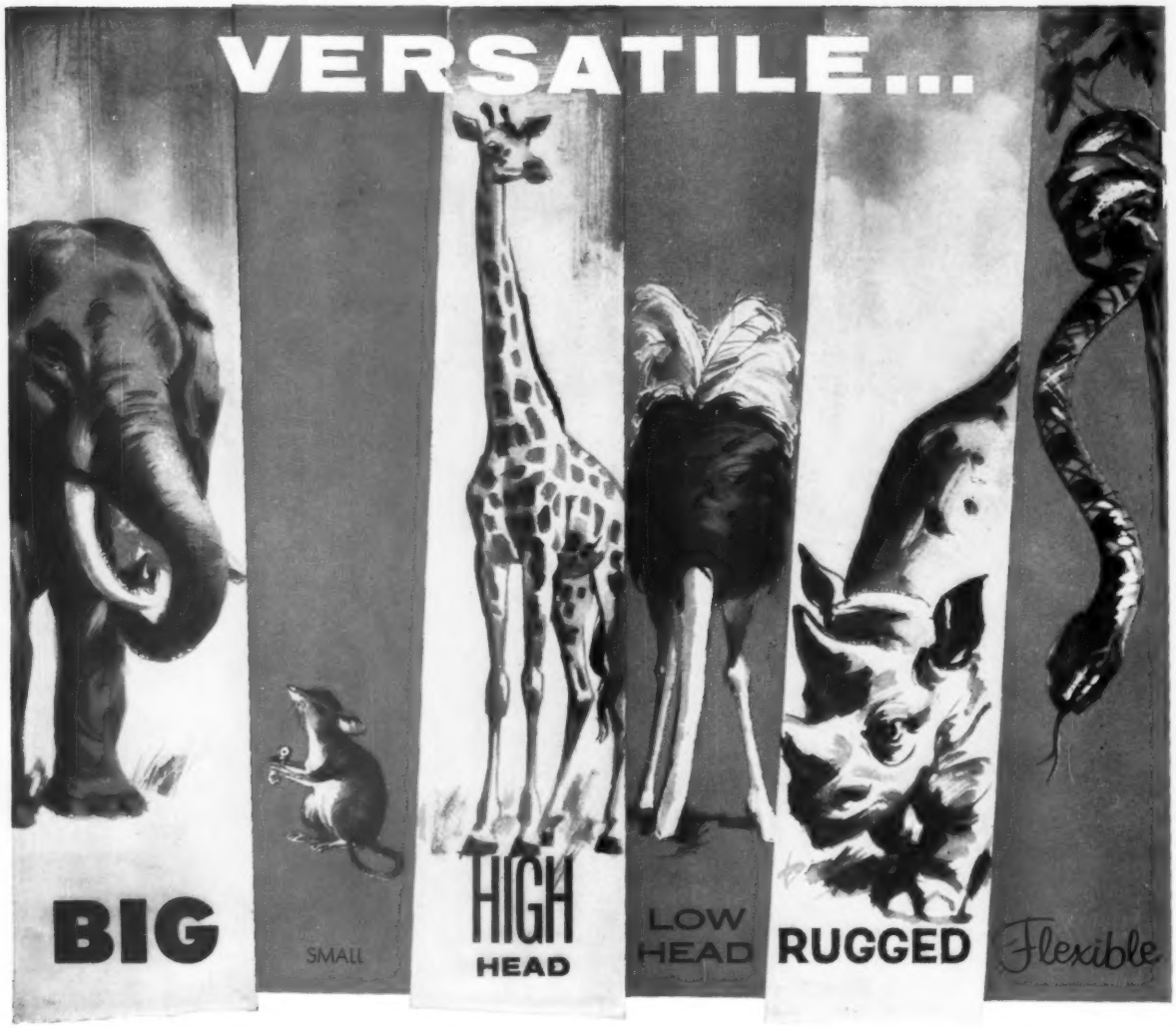
WATER & SEWAGE WORKS

WATER SUPPLY • SEWAGE DISPOSAL

UNIVERSITY MICROFILMS
313 N. 1ST ST.
ANN ARBOR, MICH.
COMP



Turnpike Sewage Plants p. 89



That's Lock Joint Concrete Pipe!

Whether it be the largest concrete pressure pipe in the world, or a small diameter drainage pipe;

. . . . pipe for the highest heads common to water works practice, or pipe for only nominal pressure or partial vacuum;

. . . . pipe to resist extremes of overburden, or pipe to meet the complexities of industrial or plant piping;

. . . . LOCK JOINT can provide all these, and more.

You will also find it a dependable, durable, maintenance-free pipe of sustained high carrying capacity which is backed by a company with over a half century's experience in the development and production of concrete pressure, sewer, culvert and subaqueous pipe.

LOCK JOINT PIPE CO.

East Orange, New Jersey

Sales Offices: Chicago, Ill. • Columbia, S.C. • Denver, Col. • Detroit, Mich. • Hartford, Conn. • Kansas City, Kan. • Perryman, Md. • St. Paul, Minn. • Winter Park, Fla.

Pressure • Water • Sewer • REINFORCED CONCRETE PIPE • Culvert • Subaqueous

There's nothing like a Cleveland J-20 for distribution trenching

- only 60" wide over its crawlers.
- hydraulically shifted conveyor.
- pulley-enclosed dual conveyor drive.
- operator controls conveyor speed and direction.
- digs 12"—24" wide, 5½' deep.
- 4 forward wheel speeds plus reverse.
- 33 positive digging speeds.
- *all* speeds in both directions.
- world's finest trencher crawlers.
- 1,000-hour track lubrication.
- full-range boom hoist.
- 330 cu. in. engine, 50 HP @ only 1250 RPM.
- hydraulic-lift crumbing shoe, optional.
- 100% control at operator location.

DIGS MORE JOBS...
IN MORE PLACES...
AT LESS COST

- works in tightest quarters.
- sneaks by poles, trees, etc.
- trenches 18" from side clearance.
- digs services as well as main extensions.
- digs all soils—hard, loose, wet, dry.
- truck-loads on shallow, excess-spoil cuts.
- conveyor capacity for deep sloped trench.
- easy on lawns, sidewalks, blacktop.
- digs trench clean, to precise grade and width.
- reliable production in all job conditions.
- simplifies job-scheduling.

Check with your distributor now... get the complete J-20 story

Good Everywhere®

The CLEVELAND TRENCHER Co.

20100 St. Clair Avenue • Cleveland 17, Ohio

from a simple CHLORINATOR in a pumping station

for water, waste, and sewage treatment

. . . consult Fischer & Porter first! Contact the Fischer & Porter field engineer serving you . . . or write Fischer & Porter Company, 130 Fischer Road, Warminster, Pa. In Canada, write Fischer & Porter (Canada) Ltd., 2700 Jane St., Downsview, Ontario.

FP FISCHER & PORTER CO.

Instrumentation & Chlorination

Vol. 107 No. 3
MARCH • 1960

A Scranton Gillette Publication

E. SCRANTON GILLETTE
Editor and Publisher

FRED C. MAURER
Managing Editor

V. W. LANGWORTHY
Field Editor

C. F. GURNHAM
Consulting Editor

•

Contributing Editors

D. P. Backmeyer	R. E. McKinney
J. R. Baylis	R. C. Merz
P. D. Haney	A. M. Rawn
C. E. Keefer	R. W. Simpson
J. P. Dye	W. A. Cawley

•

CHICAGO OFFICE: 185 N. Wabash Av.
E. S. Gillette, Publisher
H. J. Conway, Adv. Ed.
F. C. Maurer, Managing Editor
V. W. Langworthy, Field Editor
W. W. Hamilton, Western Sales Mgr.
M. C. Barr, Circulation Mgr.
R. J. Rooney, Makeup Editor

•

NEW YORK OFFICE: 155 East 44th St.
T. M. Todres, Administrative Assistant
Wm. R. Joyce, Midwestern Sales Mgr.
Terence McCoy, Eastern Sales Mgr.

•

85 Post St., San Francisco 4, Calif.
Duncan A. Scott & Co.

1901 West 8th St., Los Angeles 5, California
Duncan A. Scott & Co.

•

1201 Forest Lane,
Birmingham 9, Ala.
Fred W. Smith, Sales Rep.

•

Published and Copyrighted 1960
by Scranton Publishing Co., Inc.

•

WATER & SEWAGE WORKS is published monthly with an extra issue in August. Subscriptions including the Reference Number issue in the U.S. and Canada, 1 year $5.00; 2 years $7.50; 3 years $10.00. Other countries $1.50 per year additional. Single copies 50c except Reference Number $1.00.

MAIL SUBSCRIPTION ORDERS and CHANGES OF ADDRESS to Water & Sewage Works, 185 North Wabash Ave., Chicago 1, Illinois. Please allow four to six weeks for corrections to be effected.

E. Scranton Gillette, President; C. T. Gillette, Secretary; and H. J. Conway, Treasurer.

•

WATER & SEWAGE WORKS, Reg. U.S. Patent Off. Published monthly by Scranton Publishing Co., Inc., at 185 N. Wabash Ave., Chicago 1, Ill. Entered as second class matter at the post office at Pontiac, Ill., under Act of March 3, 1879.

WATER & SEWAGE WORKS

SEWAGE TREATMENT FOR TURNPIKE SERVICE AREAS
by H. W. Hauenstein — 89

CHARLOTTESVILLE, VIRGINIA WATER WORKS
by C. G. Haney — 95

INDIANAPOLIS WINS A.W.W.A. ADVANCEMENT AWARD — 98

TRICKLING FILTER THEORY
by K. L. Schulze, D.Sc. — 100

PUMP MATERIALS—Part I
by Igor J. Karassik — 104

CHEMICAL FEEDING AND WATER STABILIZATION— *Ohio Section A.W.W.A.* — 108

PLENTY OF WATER MAKES A DIFFERENCE
by E. R. Healey — 110

SILVER ANNIVERSARY MEETING— *Virginia Section A.W.W.A.* — 112

PLANT EQUIPMENT AND INSTALLATION— *Part II (Pictorial Review)* — 114

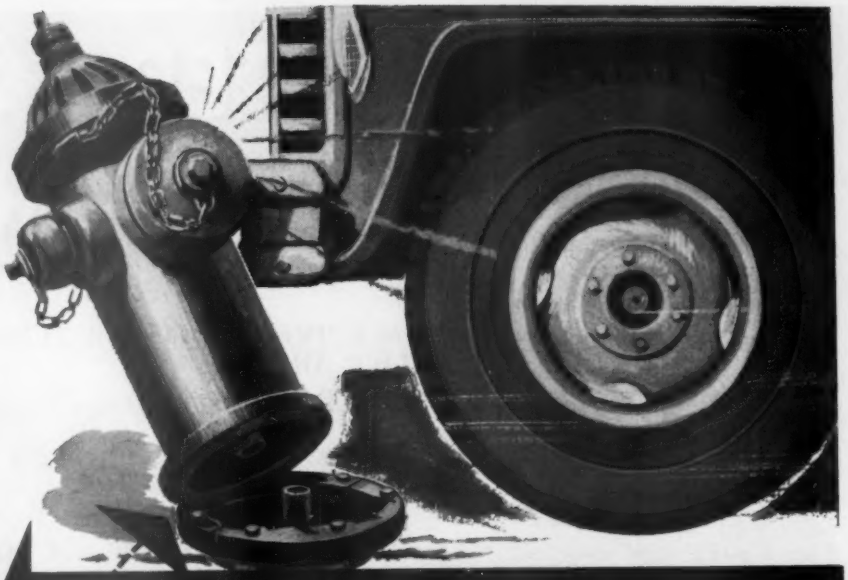
OCEAN FRONT SEWER PROJECT
by E. G. Studley — 121

LIQUID CHEMICAL FEEDING
by V. W. Langworthy — 124

RESEARCH IN WATER POLLUTION *(Report from Abroad)*
by F. C. Livingston — 126

SAFETY COSTS LESS
by G. C. Sopp — 129

News—Here & There	*7A*	*News of Suppliers*	*97A*
Washington Viewpoint	*10A*	*Meeting Calendar*	*101A*
Equipment News	*29A*	*New Bulletins*	*103A*



THIS DEMONSTRATION

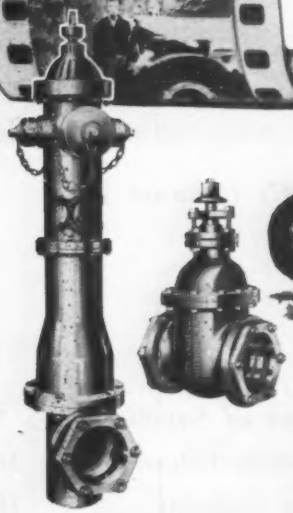
...proved the advantages of

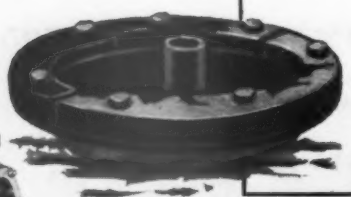
THE NEW EDDY BREAK-FLANGE HYDRANT

• Clean breaking action of the new EDDY break-flange hydrant is clearly demonstrated in this film strip of a test made recently for Mr. Herbert Campbell, Town Engineer, Wayne, New Jersey. Just as it was designed to do, the hydrant broke off at the break-flange and the coupling sheared at the weak point.

Mr. Campbell was so impressed that he changed the specifications on the spot... wrote new specifications around the EDDY Hydrant. Another EDDY feature which appeals to economy-minded waterworks officials is that these hydrants, with the break-flange feature, are the same as standard EDDY models in all other respects. Working parts are interchangeable and no separate inventory of repair parts is required.

We'll be glad to help you arrange a similar demonstration.
It pays to standardize on EDDY hydrants and valves.





NO HARM TO HYDRANT...

As shown, the safety stem coupling shears off at the ground line. The break-flange gives way without damage to stand pipe or nozzle sections. With break-flange construction the hydrant is easily and economically replaced without digging or costly repairs.

EDDY VALVE COMPANY
A Subsidiary of James B. Clow & Sons, Inc.
WATERFORD NEW YORK

Briefs

Sewage Treatment for Turnpike Service Areas is an unusual problem because the sewage to be treated is not typical—the treatment plant's effulent is usually discharged into what is at best a small creek, and the plants must be operated at minimum cost with minimum supervision—Page 89.

Charlottesville, Virginia Water Works—A report of one hundred-ten years' progress in developing the city's municipal water supply—Page 95.

Indiana Section A.W.W.A. Meeting—Water quality and water costs were among the important and interesting topics discussed at this highly successful meeting—Page 98.

Trickling Filter can be predicted by mathematical calculation which considers only depth of the filter and the hydraulic load. The equation is a design guide based on theory and supported by experimental data—Page 100.

Centrifugal Pumps Part I—Part 19 of a series and the first of two parts on materials discussing the factors that must be considered in selecting the materials of which centrifugal pumps and their parts and fittings are to be made—Page 104.

Ohio Section A.W.W.A. Meeting—Significant phases of water treatment and the techniques and equipment used in water supply were given full discussion in the papers presented and the forums conducted—Page 108.

Plenty of Water Makes a Difference, and using comic-strip ads made the difference when Champaign-Urbana, Ill., awoke the public to the merits of its water system—Page 110.

Virginia Section A.W.W.A. highlighted their Silver Anniversary meeting by honoring their past chairmen and presenting pertinent papers covering the water supply and treatment field—Page 112.

Equipment Photo Review—Part II is an added feature which shows more of the various types of equipment used in modern Water and Sewage Plants—Page 114.

Ocean Front Sewer Project—This installation involved all of the complications of a high water table and a sulfide corrosion problem that required either protection of the sewer of the use of resistant materials to prevent corrosion of the joints—Page 121.

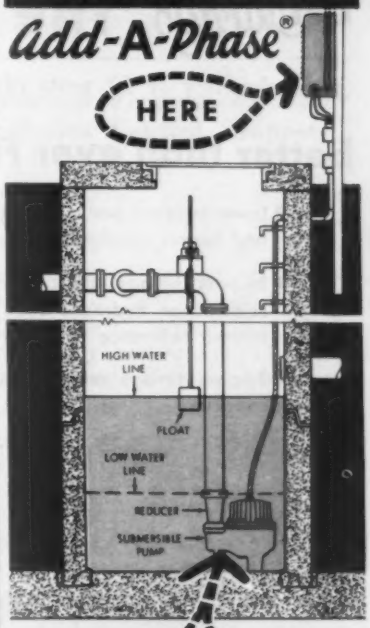
Liquid Chemical Feeding—A review of the types of equipment and operations used in this process, and of the factors that must be considered to get maximum efficiency—Page 124.

Research in Water Pollution, (from abroad), relates how both domestic and industrial waste water flow have been studied separately at a unique laboratory set-up in suburban London. For details of this report see—Page 126.

Safety Costs Less Than Accidents, not only in the incalcuable cost of human misery and suffering, but also in the measurable cost computed in terms of manpower, equipment operation and overall efficiency—Page 129.

★ "MARKETS UNLIMITED" ★

Add-A-Phase®



means 3-PHASE 220 or 440 SUBMERSIBLE OPERATION HERE from Single Phase Lines

Now, get all the benefits of dependable 3-phase submersible pump operation and be assured of trouble-free, continuous full power output with the ADD-A-PHASE Power Converter. Absolutely no expensive 3-phase wiring necessary. The Add-A-Phase is easily installed by any qualified electrician.

UNIT BALANCES OUT PERFECTLY FOR ANY LOAD

Add-A-Phase POWER CONVERTER

- 100 Rated Load
- High Power Factor
- Balanced Currents
- No Loss of Work Power

Write for Complete Information

ADD-A-PHASE
Div. System Analyzer Corp., Nokomis, Illinois

Gentlemen: Please send, without obligation, complete details on your ADD-A-PHASE Power Converter.

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____

State_____

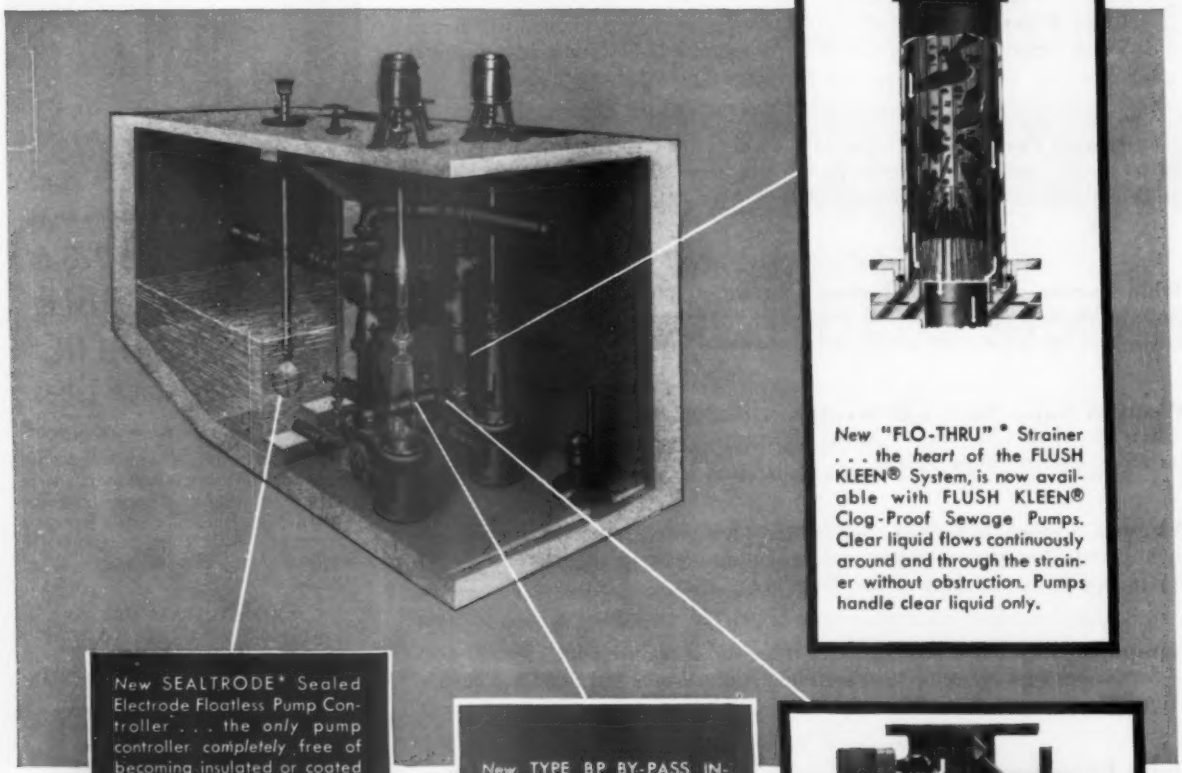
SEE FOR YOURSELF . . . package includes many case histories of the success of the Add-A-Phase . . . years of trouble free use. IF YOU HAVE A SPECIFIC ELECTRIC POWER PROBLEM GIVE US THE DETAILS FOR RECOMMENDATION.

"Chicago" the NEW FLUSH KLEEN® story

A development of 50 years of research, engineering, product improvement . . . and customer service.

better than ever FLUSH KLEEN® clog-proof sewage pumping

- Lower original cost . . . smaller pumps and motors required
- By-pass fittings allow pumps to be selected on hydraulic basis only . . . without reference to inflow
- By-pass fittings allow greater inflow capacity
- Pumps handle clear liquid only
- Absolutely reliable pumping performance
- Less maintenance
- 100% standby capacity
- Longer pump life

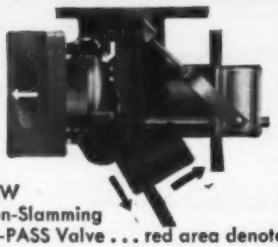


High Wet Strength Paper Products And Other Solids are never a problem with the *new* "FLO-THRU"* Strainer.

New "FLO-THRU" * Strainer . . . the *heart* of the FLUSH KLEEN® System, is now available with FLUSH KLEEN® Clog-Proof Sewage Pumps. Clear liquid flows continuously around and through the strainer without obstruction. Pumps handle clear liquid only.

New SEALTRODE* Sealed Electrode Floatless Pump Controller . . . the *only* pump controller *completely* free of becoming insulated or coated with grease or corrosive elements found in sewage and drainage water.

New TYPE BP BY-PASS INFLOW FITTINGS . . . permitting strained sewage to flow directly to the Wet Well, completely by-passing the pumps.



NEW Non-Slamming BY-PASS Valve . . . red area denotes valve open . . . allowing by-passing to occur.

OVER 13,000 FLUSH KLEEN® INSTALLATIONS

See your nearby "Chicago" Distributor today . . . or write direct for full details.

*Trademark

Putting Ideas to Work

FOOD MACHINERY AND CHEMICAL CORPORATION

Chicago Pump Company

622H DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

1960 51 YEARS CHICAGO PUMP COMPANY 1909

©1960—CPCo-FMC

News—Here & There

Engineering Firm Changes Headquarters

Jones, Henry and Williams, the thirty-three year old Toledo, Ohio, engineering firm, has announced the change of its address to 2000 W. Central Ave.

As consulting specialists in water, sewerage and sewage treatment systems, the firm has served municipalities and industries in Ohio, Michigan and Indiana.

A.W.W.A. Nominates Officers

C. F. Wertz, director of the Department of Water and Sewers, Miami, Fla., has been nominated president of the American Water Works Association at the annual meeting of the Association's Board of Directors held January 24, in New York City. Mr. Wertz currently is the vice-president of the organization.

The nomination for vice-president was received by John W. Cramer, a partner in the consulting engineering firm of Fulton and Cramer, Lincoln, Nebraska. William J. Orchard, retired manager of Wallace and Tiernan, Inc., of Belleville, N. J., was nominated treasurer.

Mr. Wertz has been a member of the Association since 1924. He served as vice-president of the Florida Section in 1946, chairman in 1947, and from 1951 to 1954, he represented that section on the Association's Board of Directors. In 1947, he was awarded the Association's Fuller Award for outstanding service in the field of public water supply.

Mr. Cramer became a member of the Association in 1947 and since has served as secretary of the Nebraska Section from 1948 to 1951. He also has been a member of the Board of Directors and has received the Fuller Award for his meritous services.

Mr. Orchard, who is completing his third term as treasurer of the Association has been a member since 1917. After serving in many capacities for the group, he was made an Honorary Member in 1937. He received the John M. Diven Medal for his services in 1954, and the Harry E. Jordan Achievement Award for distinguished public service outside the line of duty in 1956.

J. F. Dye Becomes Contributing Editor

WATER AND SEWAGE WORKS is pleased to announce the addition of Mr. J. F. Dye to its staff of Contributing Editors.

Chief Operator of the 60 mgd Lansing, Michigan Water Conditioning Plant since 1939, Mr. Dye has had long experience in this field. After graduation from Purdue University in 1923 with a B. S. degree in Chemical Engineering, he spent ten years

with the Graver organization. Mr. Dye's contributions to water chemistry have included studies of the effect of temperature on pH, split treatment, sludge recirculation and stabilization of lime-soda softened water.

His duties at Lansing also include operational supervision of the 30 tons/day sludge recalcining plant in addition to a recently acquired municipal zeolite softening plant.

When not involved with water treatment problems, Mr. Dye relaxes with his H O gauge model railroad and enjoys hunting and fishing.

Canadian Program of Water Pollution Control Proposed

A brief entitled "Some Aspects of Water Pollution and Some Recommendations for Action on Water Pollution Control by the Government of the Dominion of Canada" has recently been presented to the Honourable E. Davie Fulton, Minister of Justice and Attorney General of Canada. Author of this statement is A. L. Van Luven of Lachine, Quebec, head of the Waste Treatment Division of H. E. McKeen and Company, Ltd., consulting engineers. Mr. Van Luven has been active in industrial waste research and stream protection work for several years, and is a registered professional engineer in Quebec and Ontario.

Mr. Van Luven's brief points out the progress that has been made in public health standards, particularly in water resource protection, in the Province of Ontario and some other parts of Canada. In view, however, of the "rapidly advancing and changing technology, expanding industrialization and rapid population increases," a Dominion-wide approach to stream pollution control is recommended.

Statistics on water use and water quality are not readily available in Canada except in limited areas. There seems to be no doubt, though, that the pattern is similar to that in the United States. Problems are increasing, and need continued organized attack if they are to be controlled.

Mr. Van Luven reviews the history and practical aspects of water pollution control in the United States, including some of the statements that are still controversial; and he derives a recommended program for Canada based on this experience. His specific recommendations to the dominion government are as follows:

"The Dominion of Canada should engage in a positive research program to offset pollution. This program should include:

(a) Development of a Dominion agency with a staff of chemists, biologists, engineers, epi-

CONTINUED ON PAGE 9A

"Controlled Digestion" Additions at Oakland

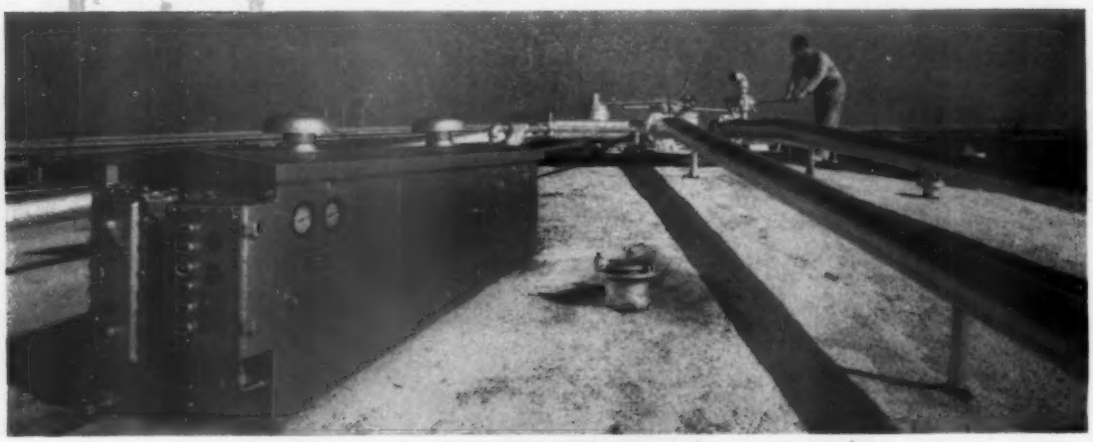
California's East Bay Municipal Utility District has made commendable steps in their clean-up program to curb pollution of the San Francisco Bay.

Their sewage treatment plant was completed in 1951 and included the following P.F.T. equipment: three 95′ Floating Covers, three #1500 Heaters and Heat Exchangers, three Floating Cover Position Indicators, Gas Safety Equipment.

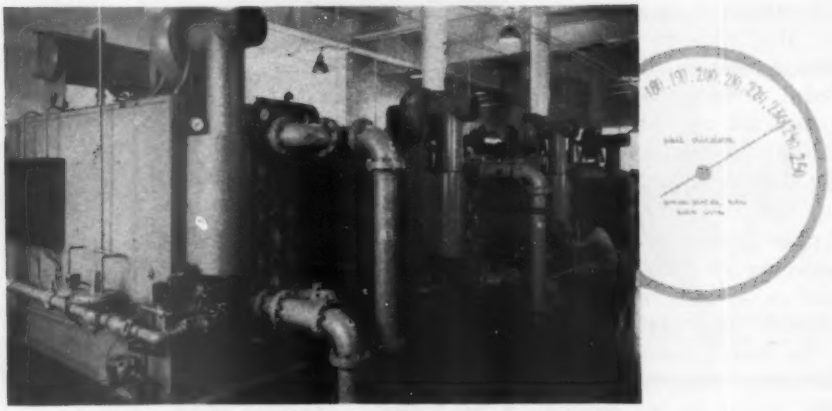
Continuing their program, in 1958 P.F.T. equipment was *again* selected which included: one 95′ Floating Cover, another #1500 Heater and Heat Exchanger and a Floating Cover Position Indicator.

1958's additions embodied all the latest digestion controls including P.F.T. Pearth Gas Recirculation for increased effectiveness of the new unit.

Plant designed by—Engineering Department—East Bay Municipal Utility District.



Above—P.F.T.'s Pearth Gas Recirculation equipment on newly added 95′ P.F.T. Floating Cover Digester.



Above—Additional P.F.T. Heater and Heat Exchanger installed in 1958. Notice the perfect blending with those installed in 1951.

P.F.T.

waste treatment equipment exclusively since 1893

PACIFIC FLUSH TANK CO., 4241 Ravenswood Avenue, Chicago 13, Illinois

PORT CHESTER, N. Y. • SAN MATEO CALIF. • CHARLOTTE, N. C. • JACKSONVILLE • DENVER

News—Here & There

CONTINUED ON PAGE 7A

demiologists, economists and lawyers.

(b) Development of training courses in all our Universities.

(c) Establish water quality criteria for all streams of economic importance. This should be handled on a case-by-case basis to avoid rigid standards.

(d) Perform an economic analysis and then provide guidance for all communities on the best methods of financing sewage treatment programs; provide or assist enabling legislation, etc.

(e) Provide a public education program which will tell this story to the voting public. The story must be told in such a way that sewage funds will be voted in spite of other important needs.

There is also the possibility that a good Dominion-wide would be welcomed by local public education program authorities who are already under heavy pressure to keep taxes from increasing.

(f) Examine our laws which govern Riparian Water Rights.

(g) Assistance and guidance in locating new industries from the polluton viewpoint. Assist in bringing about corrective measures, where required.

(h) Assist in establishing safe limits for toxic compounds in water supplies and guide industry and the public in the safe disposal of these wastes.

For example, there is the ever-present possibility of plating wastes being inadvertently discharged in limestone areas near wells, or allowing large amounts of insecticides to wash into water supplies.

(i) Provide guidance in the handling of radio-active wastes.

(j) Establish adequate stream records that will clearly show how well the anti-pollution job is being done.

This entails items such as careful measurements of the dissolved oxygen balance and an analysis of the "oxygen-sag" relationships.

(k) Establish the purification capacity and an adequate classification for all our rivers and streams of economic importance.

The Government of Canada should sponsor a Water-Pollution Control Board with representatives from Government, University, Industry, Consulting Engineers, Medical Profession, Institute of Sewage and Sanitation, and others.

This Board would do such things as: establish regulations, set standards, authorize surveys, conduct hearings, issue pollution abatement orders, and enforce such orders.

Canada should consider legislation similar to the U. S. public law 660-"Federal Water Pollution Control Act".

This legislation should have enforcement authority over International waters, Interprovincial waters, and all locations where the pollution could lead to epidemics.

This law might also provide assistance for municipalities and industries where waste treatment is judged essential by competent engineers. This aid could take the form of accelerated amortization of industrial waste treatment works, loans to municipalities, etc.

The Dominion Government should promote the formation of river-basin control agencies because each river basin is a closed community with respect to its water resources.

The Dominion Government should promote a closer cooperation between Industry, the Canadian Institute of Sewage and Sanitation, and all regulatory agencies."

EDITOR'S NOTE:—Mr. Van Luven's proposal has been widely distributed and discussed in Canada. Opinions as to its merits are divided, and it is not the intention of WATER & SEWAGE WORKS to take a positive stand on a matter that pertains solely to Canadian affairs. Certainly, however, there is everything to be gained by free and open discussion of this proposal to benefit the water resources of a great nation.

Chicago To Spend $45 Million on Water

In 1960, the City of Chicago will spend some $45,000,000 for the construction of water works, the greatest expenditure of any single year in the city's history. This appropriation includes $27,900,000 for filtration plants, $8,500,000 for various pumping stations and tunnels, and $8,600,000 for water mains.

According to Water Commissioner, James W. Jardine, "The improvements reflect a national trend among water utilities to increase capacity in anticipation of future demand." This is the second year of Chicago's current five-year $128,300,000 program designed to assure plentiful supplies of filtered water for the city and fifty-eight of its suburbs.

Wisconsin ASSE Officers Installed

New officers were installed recently by the Wisconsin chapter of the American Society of Sanitary Engineering. David J. Coughlin, assistant product manager of fibre products for Line Material Industries, is the new president. Charles Strancke and Charles A. Schlicht, Milwaukee plumbing contractors, are the vice-president and secretary-treasurer, respectively.

The newly installed officers were honored at a dinner which followed their initiation. Among those attending the dinner were Ed Zimmer, first national vice-president of the A.S.S.E., and a delegation of nine members representing Chicago.

Research Studies Iron-In-Water Chemistry

The first results of a Geological Survey study of chemical factors affecting the occurrence of dissolved iron in surface and underground water supplies, frequently troublesome by clogging water distribution systems, have been recently released by the Department of the Interior.

Water Supply Paper, No. 1459-A,

CONTINUED ON PAGE 13A

Washington Viewpoint

The almost casual way that the House of Representatives handled passage of the Blatnik Bill (HR 3610) (see January issue), indicates two things: (1) Sanitary specialists and conservationists have done a good job in selling Congress on the urgent need for combatting stream pollution; (2) most Congressmen see the matter as a good political issue, whether the bill is vetoed or not, and whether the veto is overridden or not.

As to the word "casual" above: The compromise bill—providing $90 million a year for 10 years, raising project participation by the federal government from $250,000 to $450,000—took less than a day of hammering out in the House-Senate conference committee, passed the house in less than five minutes, with no debate at all.

☆☆☆☆☆☆☆☆☆☆☆

Our tipoff (see February column) on action against worsening pollution of the Great Lakes has been followed quickly by federal and private action. Here are developments:

1. The U.S. Public Health Service has issued a new ruling, to be effective with opening of the St. Lawrence Seaway this spring, that will prohibit Great Lakes ships from polluting water supplies of port communities. It'll work this way: Ship captains entering the Seaway will be given maps showing areas around all ports where pollution must be controlled. The ship will then be required to use one of several methods: treating waste materials by an approved device; store it in suitable retention tanks until they leave the limited area; empty it into the port's sanitary system; unload garbage on the dock only if there are adequate facilities for handling it.

2. The American Petroleum Institute's Division of Transportation completed a study of numerous port areas, both on the Lakes and at seaports, found that old pollution was heavy at most of them, but offered no immediate solution pending continued study. It did, however, set up a classification system for determining sampling procedures.

3. USPHS called further attention to the increase in contaminants going into public waters, in the form of detergents, plastics and insecticides. It pointed out that such contaminants can't be completely removed by treatment methods now standard in most areas, called for added research into this problem.

4. And, while they were on the general subject, Congressmen also got into the subject of air pollution (particularly in Los Angeles), read with interest a report from USPHS on a new device for removing some of

the carbon contaminants from motor-vehile exhausts. The report indicates that the device works, but won't solve the problem completely, or alone.

☆☆☆☆☆☆☆☆☆☆☆

Meanwhile, the size of the upcoming problem in preserving water supplies for industrial and human use was indicated by a new report of the Census Bureau, and one from the Department of Commerce's Office of Business Economics.

Said Census: The population of major metropolitan areas has grown over 19.2 percent in the last 10 years, while the national growth has been about 17 percent.

Said Economics: Capital outlays by business are expected to rise to a seasonally adjusted annual rate of $34.5 billion in the first quarter of 1960—a rate about 15 percent higher than the same quarter in 1959. Much of this money will go into new manufacturing plants and their equipment.

☆☆☆☆☆☆☆☆☆☆☆

First major piece of legislation on water resources to reach the committee-hearing stage this session was S. 2549, the "Resources and Conservation Act of 1960". Key provisions would require the President to submit a "State of Natural Resources" message each year, convene a committee of advisers to keep him up to date on conservation efforts, coordination of government agencies dealing with resources, and the like.

Committee hearings were almost desultory—no opposition developed. Chances of passage are good (very little money is involved).

☆☆☆☆☆☆☆☆☆☆☆

Congress is scheduling yet another investigation into an aspect of the construction industry. This one will strike home to manufacturers and trade associations. The probe will concern itself with the prices of various building materials: Glass, plumbing fixtures, clay and concrete pipe, cement, gypsum and asbestos.

Chief prober will be Tennessee's veteran Estes Kefauver, whose special Senate subcommittee on anti-trust and anti-monopoly legislation expects to finish its current look-see at the drug industry shortly.

Kefauver singled out plumbing as a particular area of investigation (following some recent actions of the Department of Justice.) "Two months ago," he told W&SW, "a few large manufacturers in this (plumbing) industry made identical price increases, in the absence of any prior advance in the price of steel or other basic materials."

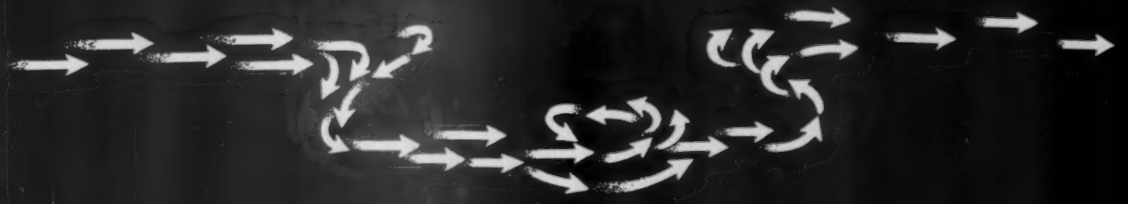
"What we want to do," he added, "is to see if a competitive picture does or does not exist in the building materials industry."

☆☆☆☆☆☆☆☆☆☆☆

The two newest plants in the Federal attempt to find economical means of making potable water out of brackish supplies will be built in Webster, S. D., and Roswell, N. M. (Both communities offered financial assistance).

The Roswell plant will be a forced-circulation vapor compression distillation process; the Webster installation will make use of an electrodialysis process. Both are to be designed for a 250,000 gallon per day (fresh water) capacity. No estimates are available at the moment as to expected cost per thousand gallons.

How to Measure Low Flows — or

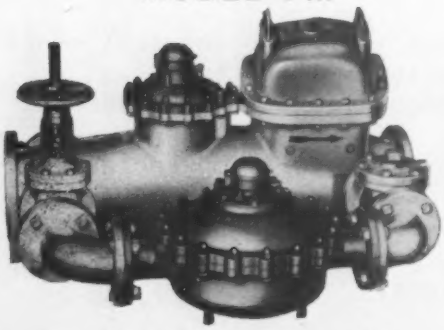


Full Unimpeded Capacity Flows

HERSEY

Detector Meter

MODEL FM



A dependable, accurate Hersey Disc Meter on the by-pass measures low rates of flow. When predetermined rates of flow are reached, the automatic lever valve becomes unseated and the main line proportional meter registers accurately the unimpeded flows through the main line. The combined readings of the bypass meter and the main line meter are your assurance of a revenue-producing combination.

Hersey-Sparling *Meter Company*

Hersey Products: Dedham, Massachusetts
Branch Offices in Principal Cities

News—Here & There

CONTINUED FROM PAGE 9A

the "Chemistry of iron in natural water—a survey of ferric-ferous chemical equilibria and redox potentials", prepared by J. D. Hemand and W. H. Cropper, is the first of a series of reports on this subject covering research work accomplished in the Survey's Water Resources Division Laboratories in Denver, Colorado.

This release may be purchased from the Superintendent of Documents, Washington 25, D. C., at the price of 15c a copy.

Other chapter releases in this series of technical reports will include such subjects as the relation of ferrous iron to bicarbonate and pH, to sulfur species, complexes with tannic acid, coprecipitation effects, and various studies covering the biochemistry of iron in water. Announcements will be made by the Department when the forthcoming chapters are available.

Water Needs Cited by Industrial Task Committee

While accepting the chairmanship of the National Technical Task Committee on Industrial Wastes, A. J. Steffen, Director of Sanitary Engineering, Wilson and Co., stated that "New processes, new products, and future plans of modern industry will require at least fifty per cent more water within ten years. This means," he continued, "that we must continue our efforts to maintain an adequate supply of clean water for industrial and other uses."

Of the main points considered at the annual meeting of the Task Committee, the following is of particular interest: The population explosion and increased standards of living in the United States will create need for additional water in the immediate future. We now use 300 billion gallons of water daily. By 1980, while our population is increasing 25 per cent, our water demands may double. Most of this water is, of course, available for re-use. One practical solution to the nation's future water problem is to learn more about maintaining quality water supplies through wise use and re-use.

Baltimore Considers Water Financing

When they agreed to expand the study of their water rate agreement to include the problem of financing future water facilities, Baltimore city and county officials decided to inquire into the city's role as "banker" for the construction of metropolitan water mains, pumping stations, and similar facilities.

This action occurred during the first meeting of a joint committee appointed to reconsider a twenty-eight year old apportionment formula. The scheduled completion date for the study was set back from March to July 1, of this year.

Three possible ways of financing future construction of water facilities, which would be shared by the two governments, are being considered. One would be the continuation of the present method under which each government pays for construction work for its own uses while the city finances facilities within its borders that are used in part for county consumers. Another method would be for the entire construction problem of the metropolitan area to be governed by the city alone. The third method being studied is that the overall problem would be handled by a regional water authority.

Safeguards Needed to Preserve Great Lakes as a Water Supply

If the Great Lakes are to be preserved as an increasingly valuable source of drinking water, then immediate attention must be given to erosion control and to the regulation of man's wastes now being introduced into the water. This warning was made by Dr. John C. Ayers, professor of zoology at the University of Michigan in a symposium on the Great Lakes Basin held at the 126th meeting of the American Association for the Advancement of Science.

Dr. Ayers cited data indicating that "in the past fifty years, all the Great Lakes except Superior have undergone the increase in total dissolved solids that accompanies the introduction of wastes, aging of the lake and decline in water quality."

His talk also pointed out that the rate of change in water quality is directly correlated with the concentration of human population. Though this is only one of the many factors bearing causatively on the problem, evidence indicates that increased erosion and the municipal-industrial wastes which accompany larger populations are the main causative factors.

Since it is estimated that the Lakes contain about 25,000 cubic kilometers of water, Dr. Ayers emphasized their value as a natural resource and of the increasing use being made this water supply. He reminded the symposium that the International Joint Commission has adopted standards regarding the pollution of receiving waters which, if followed, he believed would eliminate the problem of both municipal and industrial pollution.

Newly Formed, Ohio Water Commission

John A. Slipher, Columbus, retired extension soil conservationist of Ohio State University, is the first chairman of the Ohio Water Commission, which was formally organized last December 14, 1959. This new group, which is part of the Ohio Department of Natural Re- assistant chief of the Division of sources, selected Sherman L. Frost, Water, as its executive secretary.

The commission, which was created by the 103rd General Assembly, held its first meeting in the office of Governor Michael V. DiSalle, who explained what he hoped would develop from its research and hearings. The job of the new commission will be to coordinate the water programs within and concerning the state, to develop water supply, flood control and flood-plain zoning programs for all areas of the state, and to obtain the most beneficial use of water resources.

CONTINUED ON PAGE 15A

H_2SiF_6

HYDRO FLUO SILICIC ACID

THE ROLE IT PLAYS IN

MUNICIPAL WATER FLUORIDATION

Controlled fluoridation of communal water supplies is rapidly becoming a standard process of water treatment. And, as the process gains in popularity across the nation, so is the use of hydrofluosilicic acid gaining increased recognition because of its superiority to solid fluoride salts on many counts. The chief advantages are lower cost, greater safety and a secure source of supply. They are important considerations for any city official charged with the dual responsibility of maintaining public health and, at the same time, administering municipal funds. They deserve a closer look.

Lower cost • The economy of hydrofluosilicic acid stems from several sources. Because it is a liquid and can be shipped in tankcars and tank trucks, transportation costs are lower. Tankcar freight rates are the lowest available.

Less storage space is required, as well as less handling. Hydrofluosilicic acid can be pumped directly from the shipping or storage container into filtered water conduits, resulting in substantial savings in direct labor. On the other hand, fluoride salts require extensive feeding equipment — dry feeders, dust control, dissolving tanks, hoppers, agitators — whereas a fluoride liquid can be handled easily by a proportionating pump or other standard solution-type feeder.

Greater safety • The liquid state of hydrofluosilicic acid completely eliminates the health hazard of fluoride dust — an ever-present threat to anyone handling fluoride salts. Costly safeguards are eliminated, too. No special handling equipment is needed. No separate storage rooms, exhaust fans, expensive ductwork or other special protective equipment. Hydrofluosilicic acid requires a minimum of handling, with maximum safety.

Unlimited supply • Hydrofluosilicic acid is a recovery product. It is derived from the process of converting phosphate rock to superphosphate. And, since *International* is the largest domestic producer of phosphate rock, you are assured of a dependable source of supply both today and in the years ahead.

For additional information on physical and chemical properties, methods of analysis and water fluoridation dosages, send your specific questions to *International* at the address below.

International Minerals & Chemical Corporation
Dept. WSW-16, Skokie, Illinois

Gentlemen:
Please send additional information on *International* Hydrofluosilicic Acid. I am particularly interested in:
☐ Water fluoridation ☐ Other uses

Name.....

Street.....

City.....Zone.....State.....

IMC

*Trademark Products for Growth *

INDUSTRIAL CHEMICALS DEPARTMENT

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

Administrative Center: Skokie, Illinois

16-60

News— Here & There

CONTINUED FROM PAGE 13A

Sacramento Utility Unit Completed

Ice House Dam, the first unit in the extensive program of the Sacramento, California, Municipal Utility District, was completed recently after fourteen months of construction. It is expected that the 150 foot high, 1600 foot long structure will be ready to supply water to the first turbine generator at Jaybird Powerhouse, scheduled to start operating November, 1960.

St. Louis Increases Wages and Fees

A new wage classification system, based on job evaluation of all civil service positions in St. Louis the Metropolitan Sewer District, was adopted recently by the MSD's Board of Trustees. The Board's action followed a unanimous recommendation by the District's Civil Service Commission.

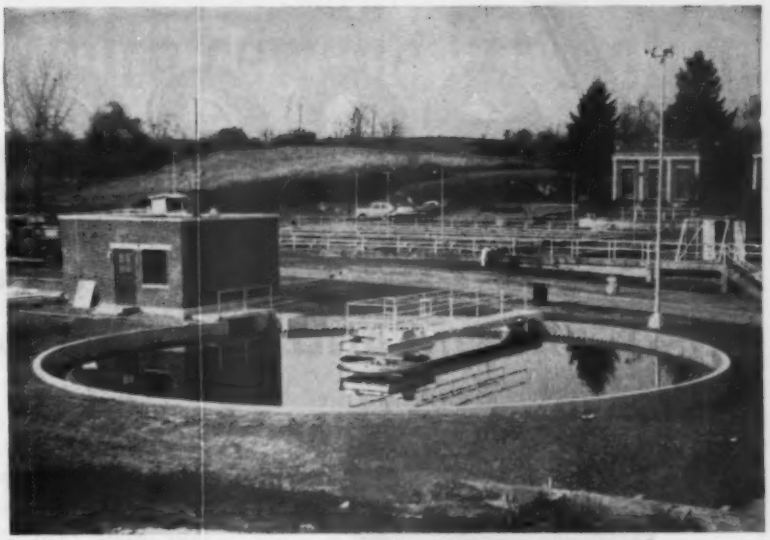
The District has about 500 employees, 480 of whom are under civil service. About sixty per cent of the employees received pay raises, which ranged from 1 to 10 per cent. No increases were authorized for department heads or other unclassified personnel.

The new plan represents a complete year-long re-evaluation by MSD's Personnel Department of all classified positions under civil service. Thus, the MSD emphasized, all salary adjustments are based on the job evaluation and anlysis program, and are not an across-the-board general wage increase.

In another action, the Board considered permit fee and plan review increases for four services affecting subdividers, contractors, and consulting engineers. The Board's action is a preparation for these services to become self-supporting within the next fiscal year.

The services affected by the increases involve these four categories: Review of plans for all new sewer construction by MSD's Engineering-

CONTINUED ON PAGE 17A



Hardinge Center-Column Clarifier recently installed at the Hagerstown Sewage Plant

another HARDINGE Clarifier for HAGERSTOWN

Original installation: Two Hardinge Rotary Clarifier Mechanisms in rectangular tanks.

Second installation: A Hardinge Primary Clarifier doing heavy duty.

- *1932*—The City of Hagerstown, Maryland, installed its first Hardinge equipment in their sewage treatment plant—two 50′ x 12′ rotary mechanisms for final clarification.
- *1949*—The City of Hagerstown, installed a 55′ diameter Hardinge circular beam-type primary clarifier for raw screened sewage in their disposal plant—H. E. Rhodes, Superintendent.
- *1958*—The City of Hagerstown installed the 60′ diameter Hardinge center-column circular clarifier pictured above, for additional final clarification in their activated sludge plant—J. L. Eyerly, Superintendent.
- *Today*—The Hagerstown Sewage Plant is now processing an average of six million gallons of sewage daily with Hardinge units, old and new alike, in full operation.

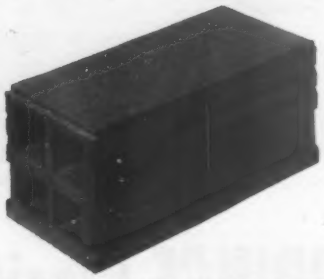
HARDINGE
COMPANY, INCORPORATED

YORK, PENNSYLVANIA • 240 ARCH ST. • Main Office and Works

New York • Toronto • Chicago • Hibbing • Houston • Salt Lake City • San Francisco • Birmingham • Jacksonville Beach

Leopold...

YOUR EXPERIENCED SOURCE FOR WATER PURIFICATION AND FILTER PLANT EQUIPMENT

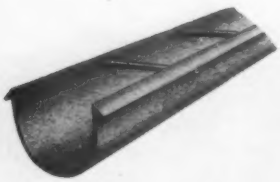


LEOPOLD GLAZED TILE FILTER BOTTOMS

• Permanent • Can't corrode • Acid and alkali-resistant • Not subject to tuberculation • Proved in over 495 plants with a daily capacity of over 3 billion gallons.

Rebuilding or adding plant capacity? You'll save time and money by calling Leopold first. Here's a company that offers you a proven record of years of filter plant design experience and know-how, plus products to meet *your* needs. Leopold filter plant equipment is engineered to give you top performance and long life at lowest "*over-the-years*" cost. Look to Leopold for tile filter bottoms, rubber-seated butterfly valves, filter operating tables, wash troughs and dry chemical feed machines. Mail the coupon below for complete details.

Leopold also manufactures flash and vertical-shaft type mixing equipment.

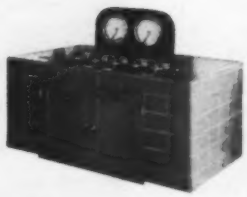


LEOPOLD FIBERGLASS-REINFORCED PLASTIC WASH TROUGHS

• Require no painting or other maintenance • Easy to handle —inexpensive to install • Last indefinitely • For all design requirements • *Also ideal for weir plates, collector troughs, baffles, etc.*

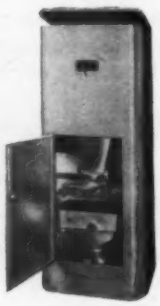
LEOPOLD RUBBER-SEATED BUTTERFLY VALVES

• Provide positive bubble-tight closure • Designed for quick installation, easy operation, minimum upkeep. AWWA construction.



LEOPOLD FILTER OPERATING TABLES

• Over 2000 in service • Standard or special models for individual needs with electric, hydraulic or pneumatic indicators. Also hydra-pneumatic control systems.



LEOPOLD DRY CHEMICAL FEED MACHINES

• Available in three capacities for volume batch feeding of dry chemicals.

MAIL COUPON TODAY FOR LITERATURE — COMPLETE DETAILS!

F. B. LEOPOLD CO., INC.
Zelienople, Pa.

Gentlemen:
Please send literature on complete line of Leopold products.
Please have representative call.

Name_____

Affiliation_____

City_____ Zone____ State_____

Exclusive Canadian Representative: W. J. Westaway, Ltd., Hamilton, Ont.

News— Here & There

CONTINUED FROM PAGE 15A

Design Department; permits for new sewer connections and for sewer repairs to insure adequate inspection; inspection of new sewer construction; and District surveying operations.

According to a Board spokesman, all four services have been operated by the District at a loss since 1956, and that the Board authorized a complete financial review of the functions after MSD Director of Finance, Richard Piatt, called the situation to the attention of the Board some months ago.

New Water Research Facilities For OSU

A new $180,000 Water Resources Center, scheduled for completion in May, 1960, will about triple the space now available on the campus for chemical and biological research in water, sewage and industrial wastes.

The new facility, now being constructed, has been made possible by a grant from the National Institutes of Health and a State of Ohio appropriation. Part of the plans include the remodeling of existing laboratory space.

In addition to providing space for university research, the new facility, together with the existing multiple process pilot treatment plant, will greatly increase the opportunities available to industrial and governmental organizations for contractual research.

New Officers for St. Louis County Water Company

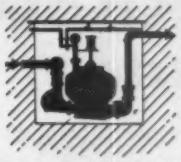
Frank E. Dolson, vice-president and manager of distribution of the St. Louis County Water Company, was elected president and director at a meeting of the board of directors. He succeeds the late W. Victor Weir, who had been president since 1946.

Herbert O. Hartung, vice-president and manager of production,

CONTINUED ON PAGE 19A

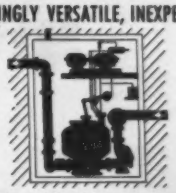
Which sewage lift station is best for your job?

TOPS IN DEPENDABILITY AND SAFETY



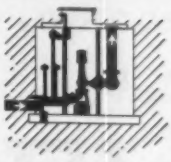
Concrete or steel underground station with Shone® Type S pneumatic ejector, mechanically controlled (warranted 25 years). Remote air supply. Nothing electrical; maintenance free, operates even under water. For municipalities and large subdivisions.

SURPRISINGLY VERSATILE, INEXPENSIVE



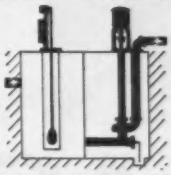
Shone® Type SAC station, underground in concrete vault. Mechanically controlled ejector (warranted 25 years) has its own compressor. Frequently less costly than package stations. Finds use everywhere.

PACKAGE STATION



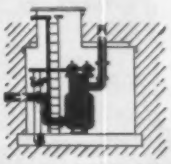
Quality underground station with vertical, short-coupled (Series 6260), dry pit centrifugal pumps. Quality design and equipment give good service life at nominal cost. For small permanent stations, growing areas.

LOW FIRST COST—EASY INSTALLATION



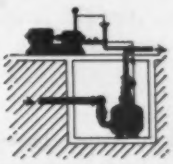
Two-compartment steel basin with centrifugal vertical wet pit pump. Pumps are not submerged; motors protected from flooding. Low first cost; fast installation. For buildings, small growing subdivisions.

ULTIMATE IN PACKAGE DESIGN



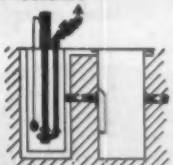
Package underground station with Expelsor® pneumatic ejector, electrode controlled. Sanitary and dependable, low maintenance, easy to service. Recommended for municipal and subdivision applications.

BUILDING TYPE STATION



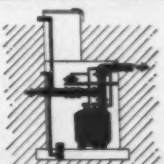
Expelsor® pneumatic ejector station designed for use in buildings. Compressor is on basement floor; ejector on floor below. Sealed installation gives safe, odorless handling of sewage indoors.

SPECIAL PROBLEMS?



Centrifugal vertical wet pit pumps with adjoining settling basin. Good for areas where sand or old sewers create problems. Special pump construction for abrasive or corrosive conditions, industrial wastes.

MAXIMUM RELIABILITY—MINIMUM SPACE



Package underground station. Expelsor® pneumatic ejector has two compartments, duplex compressors and controls. Excellent service accessibility. Especially suited for subdivision and municipal lift stations.

The answer depends on the job. Is it to be a temporary station? What about future loads? How much maintenance will it get? What type of power is available? These and many other questions must be weighed carefully and without bias. In making the decision, why not put Yeomans 61 years' experience (59 on underground stations alone) to work? Because Yeomans builds the only complete line of sewage lift stations in the industry, recommendations are impartial and in your best interest. Phone, wire, or write now.

L-5911

YEOMANS

1999-9 North Ruby Street, Melrose Park, Illinois

SPECIALISTS IN SEWAGE LIFT STATIONS—THE COMPLETE LINE

What Every WATER SUPERINTENDENT Should Know About

AMERICAN METERS

Accuracy

American Meters have an accuracy rating that surpasses the standard specifications set up by the AWWA. American Meters measure the drops to discourage water waste and increase water revenue.

The extreme accuracy of American Meters is the result of exclusive engineering design features. One of the most important of these is the greater thickness of the measuring disc which creates a more perfect seal against slippage between disc and measuring chamber wall, insuring superior accuracy of measurement.

Every American Meter is individually calibrated for accuracy by measuring, at various rates of flow, the quantity of water delivered at each revolution of the meter drive shaft. Each American Meter is fitted with the best set of change gears to give as near perfect register as possible.

Accuracy and many other superior features of American Meters are described in Bulletin 58. We will be glad to mail you a copy on request.

BUFFALO METER COMPANY
INCORPORATED

2909 Main Street **Buffalo 14, New York**

News— Here & There

CONTINUED FROM PAGE 17A

was elected executive vice-president, a newly created position.

Dolson joined the company in 1931 after graduation from Washington University, St. Louis. He is a member of the Engineers Club of St. Louis, the American Society of Corrosion Engineers, the Missouri Water and Sewerage Conference and the American Water Works Association.

Hartung, too, joined the company in 1931, is a member of the A.W.W.A., and of the Missouri Water and Sewerage Conference. In 1957, he was the recipient of the A.W.W.A.'s John M. Goodell prize for the "most notable contribution to the science or practice of waterworks development".

MSD Pioneers New Sub-Surface Testing Method

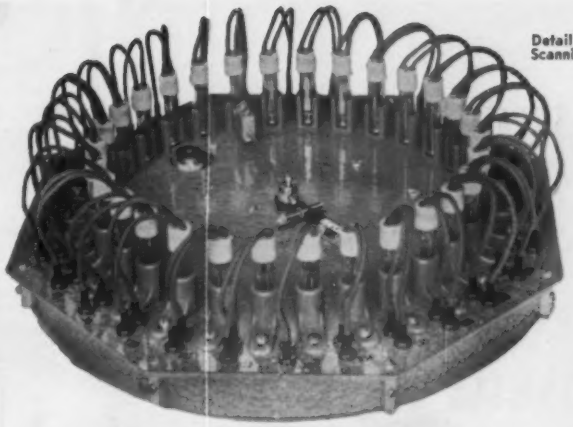
A new version of an old method for the exploration of sub-surfaces has been put into use by the Metropolitan Sewer District in order to determine rock stratas in proposed sewer subdistricts. This is the use of an instrument for seismographic recordings; a method that has been used for some thirty years in prospecting for oil.

Apparently, the MSD is the first agency in the Midwest to utilize this type of exploration for pipe line construction, although it has been used for some years by commercial and industrial companies to find gravel deposits and in searching for water for municipal systems.

Always difficult to predict with accuracy, the presence of rock is an important cost factor in any trenching work, and constitutes one of the unknown variables for which allowance must be made in the estimation of total construction costs.

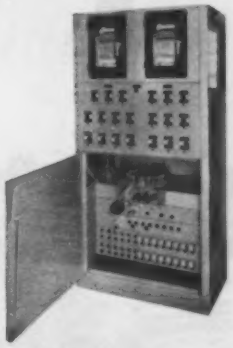
With a seismograph, it is possible to determine the average depth of a rock layer for a horizontal distance of approximately 100 feet. Seismograph soundings can be used in almost any type of sub-surface ex-

CONTINUED ON PAGE 23A



Detail View of Scanning Plate

Plan Pak Transceiver Unit, Factory Wired, Factory Tested



SELF-MONITORING TELEMETERING SYSTEM PROVIDES RELIABLE SIGNALS OVER LOW COST WIRES

Autocon

TELESCAN

After more than 10 years of research and field testing, Autocon now offers you Telescan . . . the multiple signalling telemetering system. Ideal for operating valves, pumps, gates, motors, alarms, indicating and recording devices over any distance.

RELIABLE

Assures maximum reliability . . . checks itself 10 times every minute. Fail safe. Cannot send or receive false signals.

VERSATILE

Provides up to 28 on-off or proportional signals, traveling bi-directionally or in a loop over one pair of wires. Brief interruptions will not disturb Telescan's signalling.

ECONOMICAL

Uses lowest cost telegraph (15 pulse) wires.

SIMPLE

Designed to be maintained by your operating personnel. Switches are permanently sealed in glass against dust and corrosion. The synchronous arm motor operates under conditions equal to those of an electric clock. But these are only a few of the many features. Telescan is more than a telemetering method . . . Telescan is a complete control system! To get all of the Telescan story, call your local Autocon representative or write direct to:

To get all of the Telescan story, call your local Autocon representative or write direct to:

AUTOMATIC CONTROL COMPANY

999 University Avenue • St. Paul 4, Minnesota

Standard and custom engineered control systems for water, sewage and processing for more than a quarter of a century.

THE MARK OF THE 100-YEAR PIPE

PERMANENTLY YOURS: CAST IRON PIPE

Installed... it stays installed

One thing sure about cast iron pipe—once it's in the ground, it's there for keeps! Over 100 American utilities, having used cast iron pipe steadily for more than a century, can testify to that. And *modern* cast iron pipe gives you greater assurance than ever: great beam strength resists heavy surface traffic; tremendous load resistance absorbs even the most forceful pressures. In fact, when you select cast iron pipe, you can anticipate no major repairs in your water supply system for the next hundred years!

Cement-lined—it stays cement-lined

A smooth coat of cement lining along the inner wall helps prevent the formation of flow-reducing particles. No matter how strong the water is, cast iron pipe always assures a free, steady flow.

Joined—it stays joined

Bottle-tight, rubber-ring joints give you leak-proof protection at the most vulnerable points of your system. Vibrations, surface traffic and washouts present no problem to cast iron pipe. Inherent ruggedness . . . built to perform under all adverse underground conditions . . . repair-free service for at least a century—all good reasons why your choice should be that of water utility experts everywhere. America's greatest water carrier: cast iron pipe.

Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 3440 Prudential Plaza, Chicago 1, Illinois

CAST IRON PIPE

FOR VOLUME METERING

SPARLING
WATERWORKS INTAKE METER

Wherever there are large volumes of water to be measured, this versatile meter provides greater control, increased efficiency and the opportunity for more exacting chemical feed. It accurately totalizes flows through closed conduits, inverted syphons, into reservoirs, and at many otherwise unmeasurable points. Negligible head loss makes it ideal for gravity flow systems. Installation is simple. Most perpendicular headwalls or similar structures are suitable, and the meter may be installed, removed, or inspected without interrupting service. Currently used in lines as large as 19' in diameter and can be utilized for even larger sizes.

Call your Sparling representative for complete details, or write for bulletin CF-239-1

SPARLING
WATER CONTROL EQUIPMENT

Hersey-Sparling *Meter Company* *225 N. Temple City Blvd., El Monte, California*
East Coast Manufacturing Facilities, Dedham, Mass.
Atlanta 3 • Chicago 4 • Cleveland 13 • Dallas 1, Tex. • Denver 6 • Kansas City 6, Mo. • Roselle, N. J. • San Francisco 24 • Seattle 99 • Romford, England
United Kingdom Affiliate: TYLORS OF LONDON LTD.

News— Here & There

CONTINUED FROM PAGE 19A

ploration, and the cost is said to be less than one-half that of the older style method of boring.

California Women Voters Issue Water Study

The League of Women Voters of California initiated a study of current water issues and have published the report in a 24-page pamphlet entitled, "Water Lines". The purpose of the study, like other League programs, is to promote political responsibility through the informed and active participation of citizens in government.

Of primary interest to the League is the $1,750,000,000 water bond issue which will be voted upon November, 1960. "As a result of the past year's study," the League stated, "we support a state-wide master plan for water resource development."

Among the various topics discussed in the pamphlet are, How have we met our water problems in the past, How should the State water program be financed, What price irrigation, What safeguards are needed, and What is the role of the State Department of Water Resources.

F. S. Kent USPHS Transferred To San Francisco

Frederick S. Kent, Sanitary Engineer Director, has been transferred from his position as Chief, Interstate Carrier Program, Division of Engineering Services, to the Position of Regional Program Director for Engineering Activities in the San Francisco Regional Office of the Public Health Service.

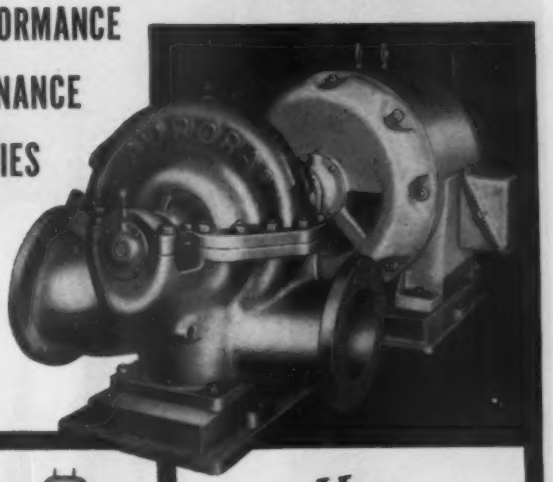
He is a Diplomate of the American Academy of Sanitary Engineers, is a registered professional engineer in the District of Columbia, and is a member of the National Society of Professional Engineers, American Public Health Association, American Society of Civil Engineers, Conference of Federal Sanitary Engineers, Conference of State Sanitary Engineers, and Conference of Municipal Public Health Engineers.

AURORA® Split Case

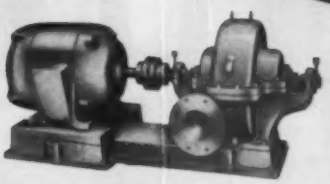
CENTRIFUGAL PUMPS

with

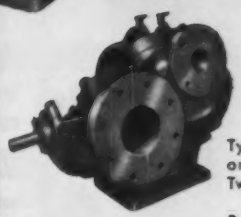
• SMOOTH PERFORMANCE
• EASY MAINTENANCE
• HIGH CAPACITIES



Type OJ Horizontally Split Single Stage Double Suction. Bulletin 105-B.



Type AJ Horizontally Split Two Stage Opposed Suction. Bulletin 106-B.



Type AJ Diagonally Split Two Stage Bulletin 106-DS

- Capacities to 6000 GPM—heads to 600 feet—continuous operation.
- Both suction and discharge on bottom half of case . . . piping or motor-pump alignment never disturbed . . . lugs on top half of case for easy removal . . . by-pass in lantern ring exposed in lower half of case . . . fast, easy to inspect, clean and maintain . . . lines are back in operation fast!
- Streamlined liquid flow . . . hydraulically and dynamically balanced impellers . . . perfect alignment with in-line boring with top half of case in position . . . large standardized shaft sizes for maximum strength . . . short bearing centers for maximum rigidity and balance . . . low NPSH . . . smooth, long-term top performance . . . long life!

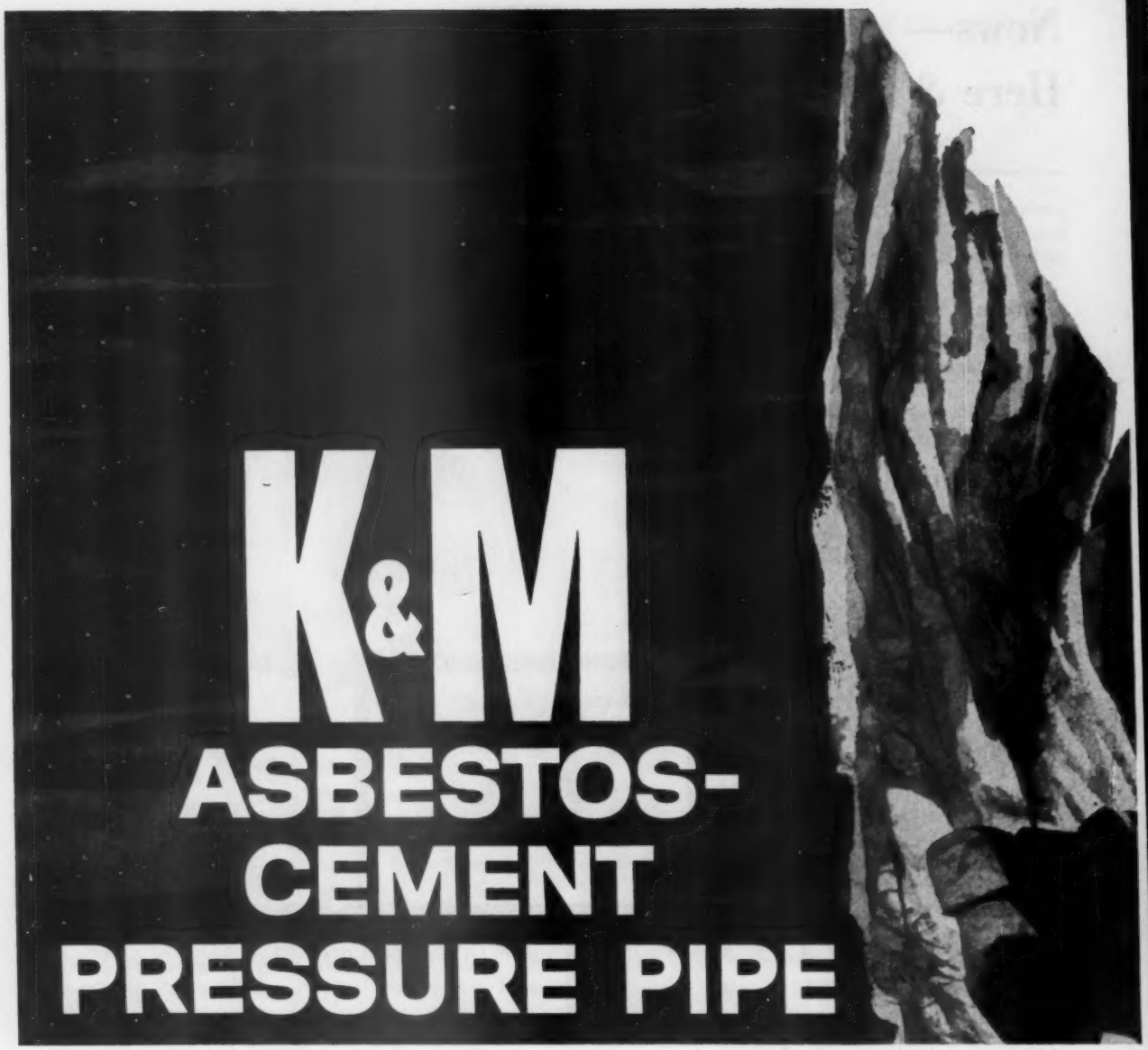
IDEAL FOR: Water Service • Boiler Feed • Circulating • Cooling Tower • Pressure Build-Up • Fuel Transfer • Boosting to Pressure or Elevated Tanks • Many General Applications.

AURORA Always PUMPS

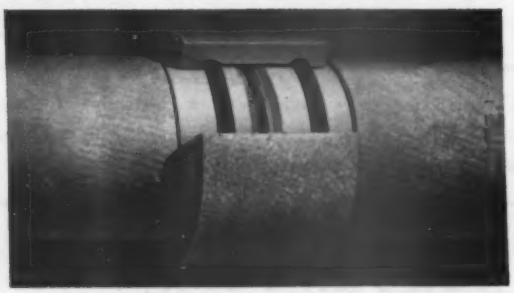
FOR COMPLETE INFORMATION WRITE—OR CALL

AURORA PUMP DIVISION
THE NEW YORK AIR BRAKE COMPANY
1020 LOUCKS • AURORA, ILLINOIS

LOCAL DISTRIBUTOR IS LISTED IN THE YELLOW PAGES OF YOUR PHONE BOOK



its bore stays clean year after year



The finest coupling in the industry! Exclusive patented "K&M" FLUID-TITE Coupling connects in two easy steps. Seals tight and stays tight . . . no matter how high the pressure climbs. Sealing rings are self-energizing. No cumbersome coupling puller is required. And, a 5° deflection per coupling if you need it.

"K&M" Asbestos-Cement Pressure Pipe is as *modern* as the Jet Age in which we live. This tax-saver sends maintenance costs tumbling.

The bore remains smooth and clean . . . no clogging and no rusty discoloration of water . . . and pumping costs remain low. Being made of tough, high-tensile-strength asbestos fibers and portland cement, "K&M" Asbestos-Cement Pressure Pipe is practically indestructible. Won't corrode or tuberculate. And, it's completely immune to electrolysis. Joints are permanently, automatically root-tight and water-tight.

for uninterrupted, trouble-free service

"K&M" Asbestos-Cement Pressure Pipe is a thrifty pipe. Its low initial cost is often your last cost. Its lightweight reduces shipping and handling costs.

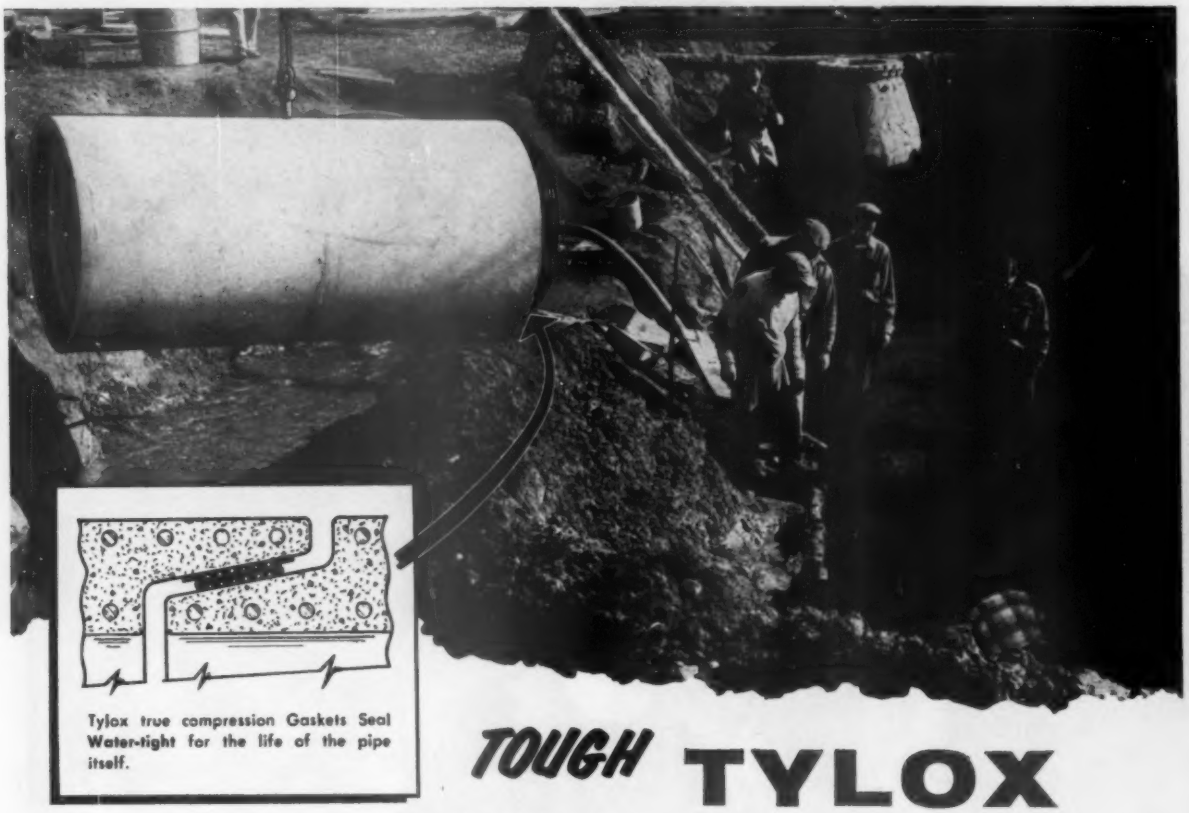
This thrift carries over into installation. You can install "K&M" Asbestos-Cement Pressure Pipe in practically all kinds of weather and soil conditions . . . with unskilled labor . . . and without heavy machinery. In fact, you can lay more pipe per hour than you've ever done before.

What makes "K&M" Asbestos-Cement Pressure Pipe so special? Eighty-five years of asbestos engineering by one of America's pioneers in asbestos products. Put this wealth of experience to work for you. Write to us today.

K·M
BEST IN ASBESTOS

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

Keeping new sewer lines from leaking...



TOUGH TYLOX *FLEXIBLE* PIPE GASKETS

...specified to whip tough sewer installations

This view of the Millcreek Sanitary Sewer Project clearly shows some of the tough conditions met... high water tables... flooded trenches... sandy, unstable soils.... It shows, too, how TYLOX Flexible Rubber Gaskets "join up" with sewer pipe to offset *tough* installation problems with fast pipe-laying, providing at the same time, the all-important water-tight joints necessary to meet tough infiltration specifications. When pipe is coupled with TYLOX Gaskets, trench water does not slow up the work, shifting soils do not endanger the Gasket, and the acid-resistant *compression* seal provides leak-proof joints for the life of the pipe itself.

The project, by Millcreek Township Sewer Authority, Erie County, Pa., is a $4,000,000-plus project including 45 miles of sewer laterals, trunks, mains and pumping stations. Engineering is by Consoer, Townsend & Associates, Consultants, Chicago, Ill., and Fred Gorenflo, Resident Engineer, Erie, Pa. Contractors are Berlanti Construction Co., Harrison, N. Y., and Milano Construction Co., Erie, Pa. Pipe using TYLOX Gaskets was furnished by Concrete Pipe Company of Ohio.

5129

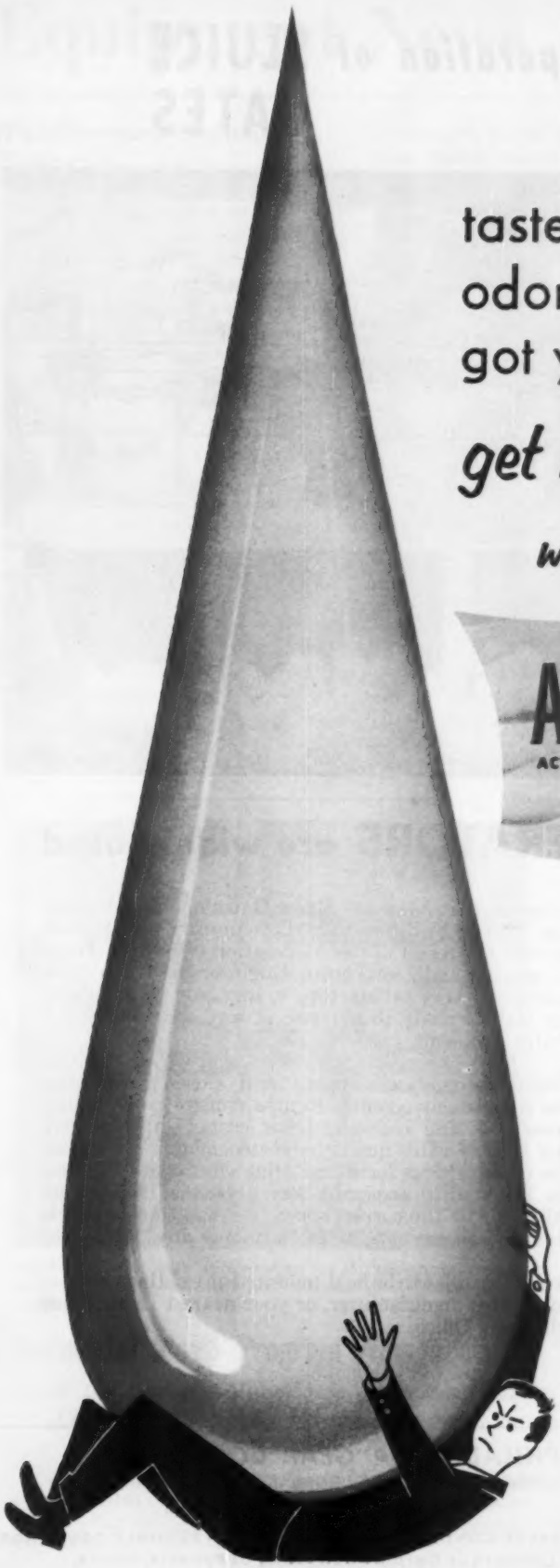
Whether you are planning pipe lines of B & S, T & G or Recessed pipe, of any size, there's a TYLOX Rubber or Neoprene Gasket in the Hamilton Kent family of flexible true compression Pipe Joints to meet your specifications. Write for engineering details.

HAMILTON KENT MANUFACTURING COMPANY

KENT, OHIO

427 West Grant St. ORchard 3-9555

CANADIAN PLANT: 10 BRUSSELS ST., NEW TORONTO, ONT., Phone Clifford 1-2494



taste and odor problems got you down?

get back on your feet with

AQUA NUCHAR

ACTIVATED CARBON FOR TASTE AND ODOR CONTROL

Over and over, AQUA NUCHAR proves that nothing surpasses the effectiveness of activated carbon for eliminating taste-and-odor-forming substances.

Every gram of AQUA NUCHAR contains 120 billion particles of activated carbon with a surface area of 800 square yards. More surface . . . more adsorption . . . higher efficiency! Greater economy, too, because of the low concentrations of AQUA NUCHAR required (as little as 2-5 ppm average).

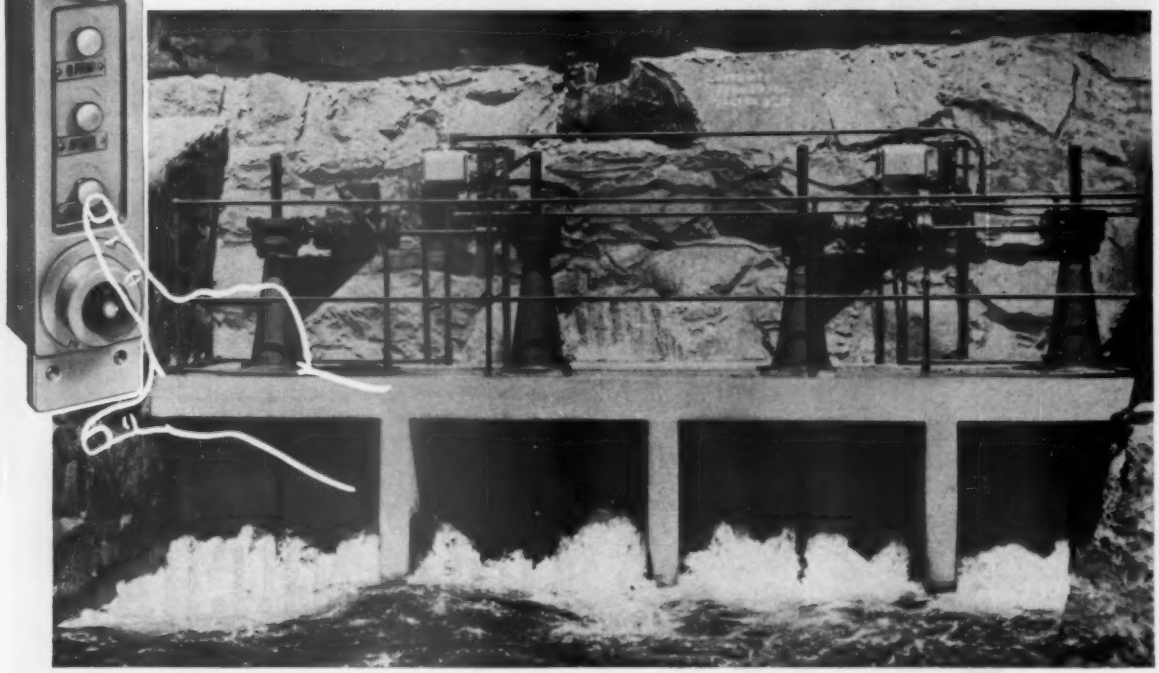
More than 1200 water plants have found that AQUA NUCHAR, properly applied, is the only method universally effective against all causes of taste and odor.

So when taste and odor problems get you down, phone or write us. Our field technical service staff is ready to help you set up a PALATABILITY program in your plant.

industrial CHEMICAL SALES
division west virginia pulp and paper company

230 Park Ave., New York 17 · National Bank Bldg., Philadelphia 7
35 E. Wacker Dr., Chicago 1 · 2775 S. Moreland Blvd., Cleveland 20

Push-Button operation of SLUICE GATES



LimiTorque OPERATORS are widely used

Shown above are four 54" x 54" Sluice Gates operated by *two* LimiTorque Valve Operators . . . This unusual design and installation was the result of the cooperation of Rodney Hunt Machine Company and LimiTorque Engineers and proved to be economical and very satisfactory in service. Our sales and engineering staff is ready to aid you at any time with your valve operator problems.

LimiTorque automatically opens and closes valves and sluice gates from a conveniently located control point—eliminating guesswork and reducing labor costs. One man can operate any type of valve quickly and dependably in remote, inaccessible or hazardous locations; thus vital operating procedure can be handled easily by key personnel, safely and economically, and at the correct speed . . . And these controls may be mounted on any size valve, in almost any position or location.

LimiTorque controls can be field-mounted on existing valves—contact your valve manufacturer, or your nearest LimiTorque Sales-Engineering Office.

Write for complete Catalog L-550—and please use your Business Letterhead when requesting it.

THERE IS NO SUBSTITUTE FOR —

LimiTorque®

PHILADELPHIA GEAR CORPORATION

KING OF PRUSSIA (SUBURBAN PHILADELPHIA), PA.

Offices in all Principal Cities

INDUSTRIAL GEARS & SPEED REDUCERS • LIMITORQUE VALVE CONTROLS • FLUID AGITATORS • FLEXIBLE COUPLINGS

Limitorque Corporation • King of Prussia, Penna.

Equipment News

High-Precision Sequence Timing

301

Heuer Timer Corporation, New York, N. Y., has recently introduced a sequence timing board for actuating three stopwatches at precisely the same instant with a simple squeeze of the hand which carries the board. Based on a design devised and widely used by professional, time-and-motion experts to collect "standard data", and called the Multi-Sequence Board, the apparatus is finding new applications in laboratory research, field action-studies, and many other classes of scientific, engineering, logistic, medical and sociological work.

The unit times a sequential step with zero time loss between those steps, and with no necessity to read timer hands while they are in motion. Proper procedure is to start with timer 1 at zero, and timer 3 in motion. Thus, each step under observation is timed in with the self-same motion that the preceding step

is timed out, and the observer has the entire duration of any step to record "frozen" data from the previous one.

When used with Heuer central-register decimal timers, data are recorded in hundredths of a minute (and, by interpolation, in thousandths) for a simplified "per-minute" rate calculations. Both hour-decimal timers (for "per-Hour" rate studies) and standard fifth-of-a-second timers are also commonly used with the board. The new board will accept any stopwatch of standard size. Start, stop and fly-back must be by successive depressions of the crown.

Lightweight Pipe Insulation for Low Temperatures

302

Union Asbestos and Rubber Company, Fibrous Products Division, Bloomington, Ill., has announced the availability of Unarco U-200, a lightweight, rigid, urethane-foam pipe insulation especially designed for use at temperatures ranging from —300° F to +220° F. It is reported that recent tests reveal this new product has a K factor of only 0.14 at 70° F.

Other features of the U-200 insulation material are that it has a density of only 2.3 lbs. per cubic foot, and that it has a high, compressive

CONTINUED ON PAGE 31A

(Advertisement)

Smith & Loveless sales representatives use this convenient, portable projector to show the firm's first industrial movie to prospective customers.

Industrial Movie Program Wins Acclaim

Smith & Loveless Color Movie on Factory-Built Lift Stations Applauded by Engineers, Public Works and City Officials.

The world's largest manufacturer of factory-built sewage lift stations has come up with "just about the world's easiest method" of showing their first industrial movie to prospective customers.

Sales representatives of Smith & Loveless, Lenexa, Kansas, use a special-built, continuous projector to show the firm's color-sound motion picture to engineers, builders, public works and city officials all over the United States and Canada. The projector, called a Cinesalesman, takes only seconds to set up and operate. It looks like a portable television set and is ideal for office calls on busy executives. Forty-five of the projectors are now in use to tell the Smith & Loveless story on factory-built sewage lift stations.

Movie Has Educational Value

The movie emphasizes the manufacture, operation, design features and installation of Smith & Loveless pump stations, used in municipal and suburban developments to raise sewage to a higher level or treatment facility. It includes a complete tour of the Smith & Loveless manufacturing plant near Kansas City.

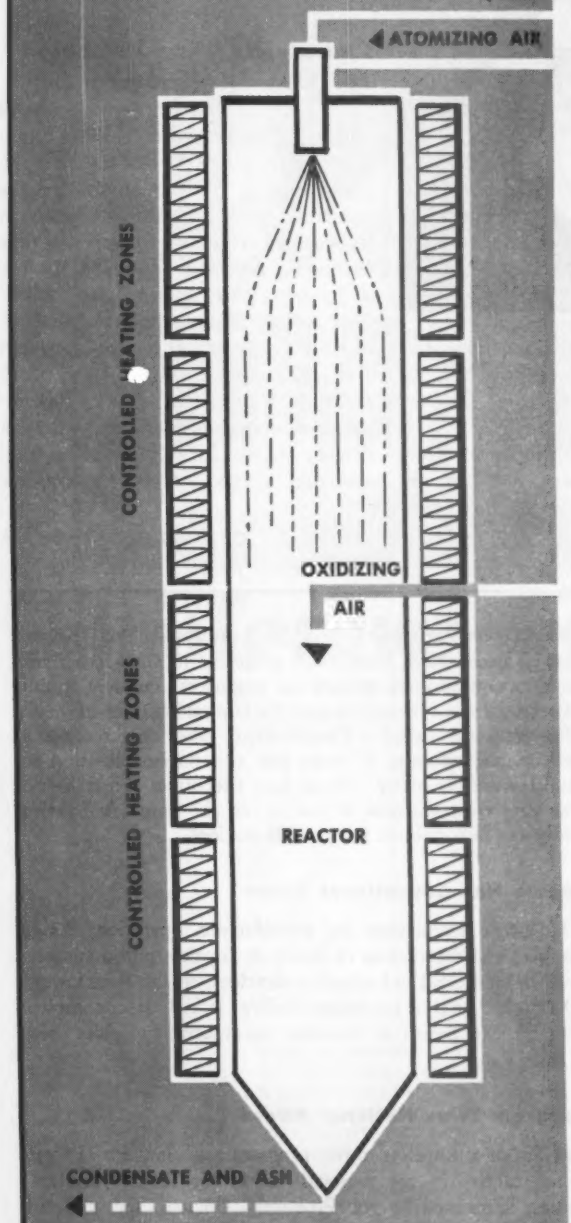
Program Wins National Award

The Smith & Loveless movie program was cited for "Exceptional Merit" in the national "Ideas for Home Builders" contest sponsored by the Producers' Council, Inc. and the National Association of Home Builders, Washington, D. C. The award represented the top honor in its class in the nation-wide contest.

Copies of the film are available for meetings and classroom use. Special showings can be arranged by contacting **Department 20, Smith & Loveless, Division—Union Tank Car Company, Lenexa, Kansas.** 2480

AST:

sludge to ashes in 60 seconds



Using the ATOMIZED SUSPENSION TECHNIQUE developed by the Pulp & Paper Research Institute of Canada, National Welding Co. Ltd., has designed and built a sewage sludge disposal unit that is entirely revolutionary. Requiring a very small amount of land it eliminates the need for digestion tanks and drying beds. It reduces the sludge to pure water and inorganic ash in 60 seconds.

AST is virtually automatic and requires a minimum of supervision. The first AST community sludge disposal unit is operating in the town of Beaconsfield, Que. AST is also eminently suited to disposal of industrial wastes.

Inquiries are invited from Canadian and U.S. communities, industries and their consulting engineers.

NATIONAL

AST DIVISION

NATIONAL WELDING CO. LTD.

8235 Mountain Sights Ave. • Montreal, Que. • Telephone: REgent 9-3241

Equipment News

CONTINUED FROM PAGE 29A

strength. It is not affected by most mastices and sealers usually used for cold insulation; it is self-extinguishing and has no capillarity. Its humidity, water-absorption and hygroscopicity are very low.

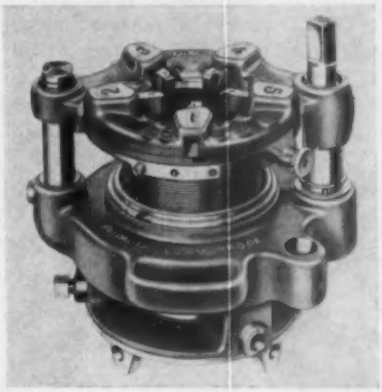
Moreover, it is non-toxic, non-irritating and can be cut to size and shape quickly and easily with simple hand tools. It is available in half-round sections 36 inches long, or in block form.

Geared Pipe Threader is Jam Proof

303

Ridge Tool Company, Elyria, Ohio, has introduced their new, Ridgid No. 141, Jam-Proof geared threader that is designed to thread 2½-inch. to 4-inch pipe and conduit without requiring the changing of dies. Only a single set of dies threads 2½, 3, 3½ and 4-inch pipe sizes, and the threader is readily adjustable for making straight or tapered, over and under size threads.

The principal feature of the unit is its jam-proof design. The drive pinion kicks out automatically, thereby preventing costly repairs and delays. Another time saving feature of the unit is the cam-action, work-



holder that sets exactly to size by a simple turning of the adjusting collar.

Strain Gage Adapter for Cost Indicating and Recording

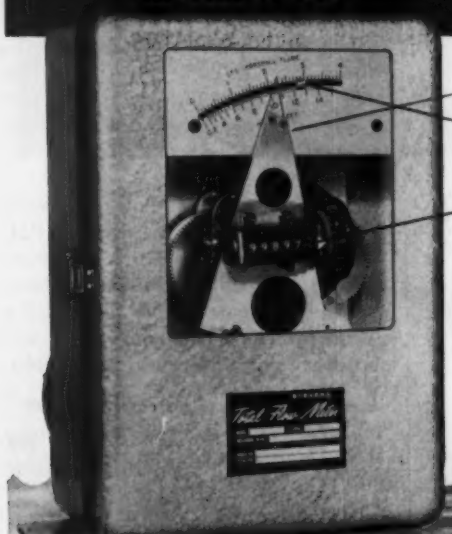
304

Ramapo Instrument Co., Inc., Bloomingdale, N. J., has available its SGA-100B Strain Gage Adapter that makes possible precision indicating, recording and controlling with strain gage transducers by utilizing equipment readily available in most installations. All necessary circuitry is included for the read-out of any strain gage type flow, pressure, weight, or force transducer on self-balancing D.C. millivolt potentiometers or recording oscillographs of suitable sensitivity.

A zener regulated bridge supply is used with the excitation adjustable between 2.5 and 10 volts D.C. nominal. It contains the zero and span controls and an internal calibration signal of the series type. Calibration resistors are contained in plug-in modules to permit use with any four arm resistive bridge of 120 ohms or greater. It utilizes 105-125 volts, 60 cycle power and gives an output of 0-10 to 0-30 millivolts D.C. depending upon the transducer.

CONTINUED ON PAGE 32A

STEVENS
TOTAL FLOW METER
Model 60M



Low-cost meter provides essential flow data for operation of sewage treatment plants

- **INDICATES FLOW**—Rate of flow and head are indicated by pointer and scale.
- **INDICATES PEAK FLOW**—Sliding red index on scale indicates peak flow.
- **TOTALIZES VOLUME**—Counter totalizer registers total flow.

Mechanically operated meter provides essential data in measurement of sewage, industrial wastes, irrigation water or other liquids flowing in open channels. Standard meter gives direct flow reading in cu. ft./sec. and totalizes volume in cu. ft. Readings are easily converted to other units of measurement.

The instrument is designed for use with Parshall flumes and various weirs. It is entirely mechanically operated, will function without attention for eight-day intervals, and is easy to install on table, shelf or wall. If a graphic record is desired, the meter can be used with a Stevens Type F Recorder. Write for Stevens Hydrologic Instrument Short Form Catalog No. 23, and for Bulletin 28 which describes the Model 60M meter in detail.

HYDROGRAPHIC DATA BOOK—Valuable reference file, 124 pages of technical data on recorder installation, plus a variety of hydraulic tables and conversion tables. $1 copy. (No C.O.D.'s)

LEUPOLD & STEVENS INSTRUMENTS, INC.
4445 N. E. Glisan Street, Portland 13, Oregon
Specialists in hydrologic instruments for over half a century

Equipment News

CONTINUED FROM PAGE 31A

Multi-Motor Phase Conversion System

305

System Analyzer Corp., Nokomis, Ill., is offering a new, auto-transformer type phase converter which operates any number of three-phase motors to 30 HP from single-phase lines, either independently or simultaneously.

Called the Add-A-Phase, Type MM, it operates with a master transformer station and separate panel controls for each motor and produces more than the 100 per cent rated horsepower for any or all of the motors in the system with the same efficiency as though they were connected to a three-phase line.

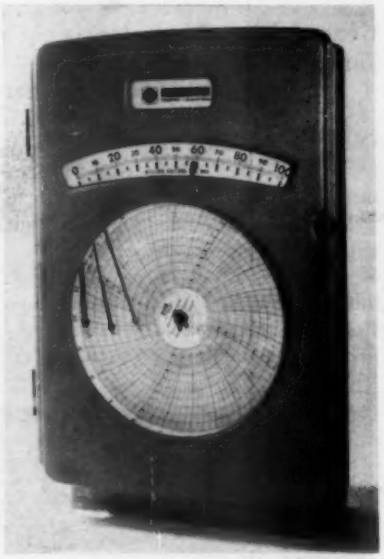
Both Delta and Wye wound motors are equally handled, operating with unity power factor and with inrush currents considerably less than a single-phase motor.

Recorder-Receiver Instruments for Remote or In-Plant Telemetering

306

Builders-Providence Division of B-I-F Industries, Providence, R. I., have announced the availability of several new, more sensitive and versatile Chronoflo, Recorder-Receiver arrangements.

The new design features include; a newly-engineered power positioner with faster, quieter response; 2,4,8,



15, and 60-second time-cycles; as many as 16 control switched for alarm and control functions; a swing-out panel for easy access; modular construction; and multiple pen arrangements.

For telemetering flow, pressure, temperature, level, position, RPM, electrical quantities, the New Chromoflo is compatible with supervisory control systems, such as B-I-F's Synchro-Scan, employing tone, micro-wave or radio-transmission links.

Liquid Level Controls

307

Magnetrol, Chicago, Ill., has made available low-cost liquid level controls in which all parts of the con trol in contact with liquids or vapors are non-metalic. These are the new, NM-1 and NM-2 Magnetrols for use in controlling liquids that present problems in handling.

CONTINUED ON PAGE 34A

This Changing World

For hundreds of years, the fastest Man could travel was by riding a running horse at about 35 miles per hour. In 1830 the steam engine was invented, and then in 1910 the airplane which today travels at over 600 miles per hour. Man's weapons have changed from a sling-shot to a spear to a bow-and-arrow to gun-powder to nuclear bombs. The only thing which never changes is change itself . . . change goes on almost continuously in myriad ways.

American cities have been steadily increasing in population and likewise spreading out into suburbs and "suburbs of suburbs". So more water is needed and distribution mains need to be longer with more valves and fire hydrants and more footage of main per customer. Engineering experts agree that to give adequate service, U. S. water and sewage facilities today need to be doubled!

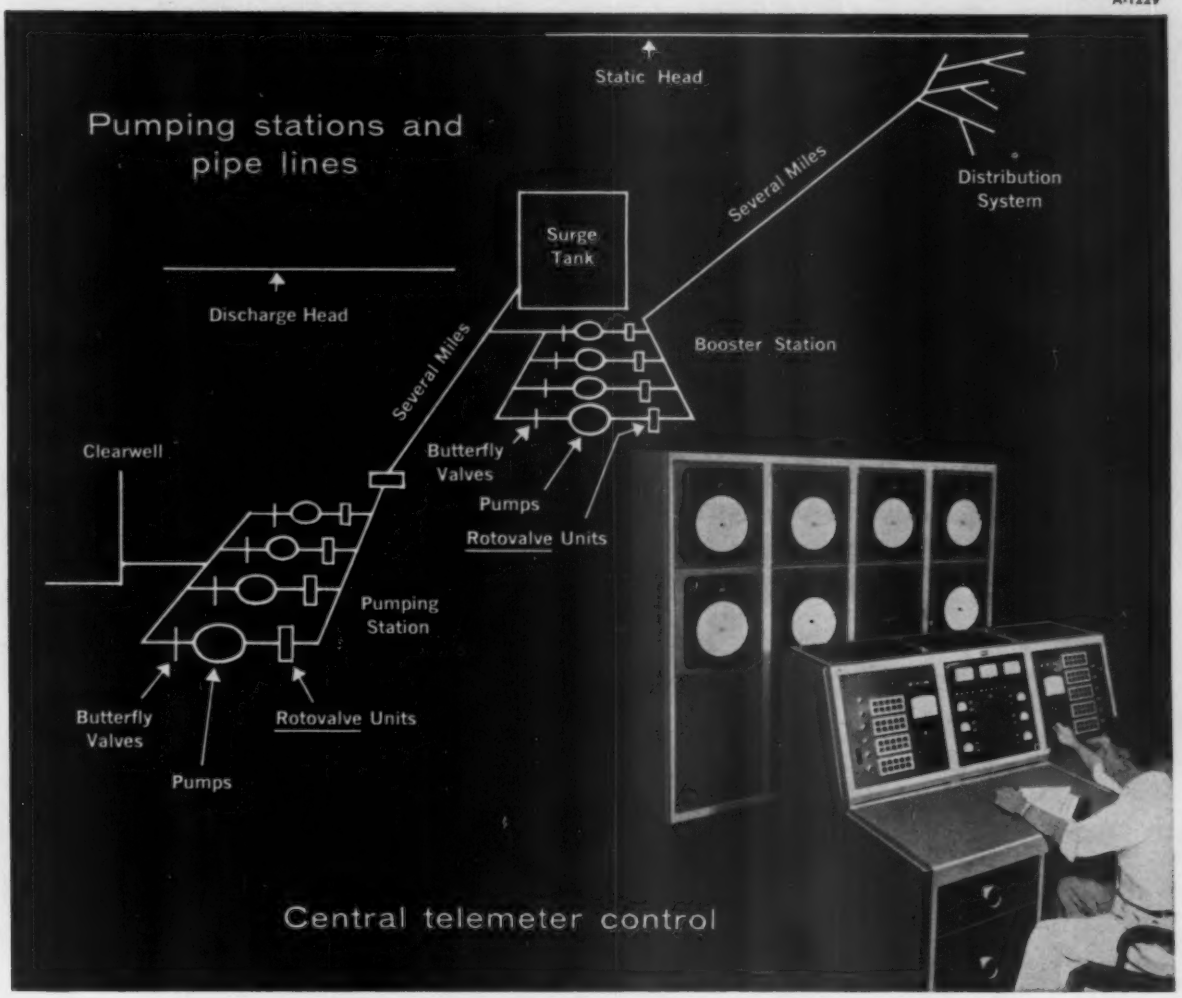
Why do so many people face this spectacle of almost continuous and eternal change with a stoical indifference which history shows often has been an obstacle in the path of progress? Why not ask John Q. Public for advice? He might be flattered. He might realize that the water problem is his problem too, and become more interested in its solution.

This series is an attempt to put into words some appreciation of the water works men of the United States.

M&H VALVE AND FITTINGS COMPANY
ANNISTON ALABAMA
SUBSIDIARY OF WALWORTH

ALLIS-CHALMERS

A-1229



One man controls 60 mgd with

telemetered valving

Pumping stations operate completely unattended, controlled from a central remote console in this major water procurement and distribution system. Rated for 60-mgd peak load, it distributes over a 100-square-mile area from widely separated stations and storage tanks.

This is another dramatic example of complete valving service offered industry by Allis-Chalmers. Whatever you're dealing with, liquids or gases, including highest temperatures and pressures — Allis-Chalmers is your convenient source of today's most comprehensive rotary valve line. Types and sizes cover virtually every need . . . including *Rotovalve* units, butterfly and wafer valves and ball valves. We can also assist you in every phase of planning, engineering and installation. *Contact your Allis-Chalmers representative, or write* ***Allis-Chalmers, Hydraulic Division, York, Pa.***

Rotovalve is an Allis-Chalmers trademark.

Key to a superior valving system, Rotovalve **units offer the least pressure loss . . . ideal flow characteristic . . . controlled timing . . . positive seating . . . easy operation always.**

Equipment News

CONTINUED ON PAGE 32A

The advantages of the new models are: immune to galvanic or electrolytic attack; corrosive resistant; immune to oxidizing agents; smooth surface discourages any tendency to scale or act as host for deposits; will not contaminate or impart odors or tastes to the liquid.

The controls provide safety in handling inflammable and explosive liquids, as well as in volatile fume areas, because the construction is of non-flammable and non-sparking materials. The new models may be used in controlling any liquid of specific gravity .70 or above. The chamber and float construction are for service at 100 psi and 70F, or 50 psi at 140 F.

Check

RATE OF FLOW AT A GLANCE

Complete and accurate water meter testing requires definite knowledge of rates of flow. The Ford Testerate Indicator provides quick, precise readings in gallons per minute and is a useful and valuable accessory in any modern meter shop. Accuracy is within 2% down to 1 GPM, and the operator can make corrected readings with rates of flow as small as ¼ GPM.

Easily connected to any meter testing outfit. Write for complete information.

FORD

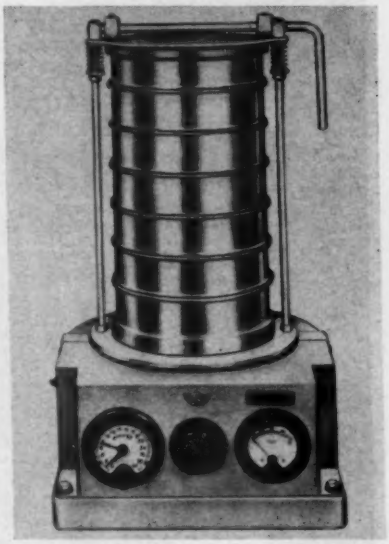
FOR BETTER WATER SERVICES

THE FORD METER BOX COMPANY, INC. Wabash, Indiana

Timing Device For Consecutive Testing

308

Syntron Company, Homer City, Pa., is offering a new, timing device for use on the company's Model



TSS-31 Test Sieve Shaker. By merely pressing a button, the timer is reset for the same time cycle as the previous run, thus eliminating any variation which may occur if the timer would be reset by hand. The cycle hand on the timer shows the elapsed or remaining time.

Other features of the test sieve shaker include an improved vibrating drive unit which provides positive vertical and rotating horizontal movements, which combine to make separation through the various screens more rapid.

Teflon "Cup & Cone" and "Wedge" Packing Sets

309

Chemical and Power Products, Inc., New York, N. Y., are offering their "cup and cone" style and "wedge" style, Teflon packing ring sets which make tight, secure seals under minimum gland pressure. A nominal force applied to the gland causes the rings to slide against each other, thereby exerting pressure both against the stem or rod, and against the bore of the stuffing box.

These two styles have been used effectively in many static and semi-static applications where rotation is not a factor.

CONTINUED ON PAGE 37A

"Did I get burned by a low pump bid!"

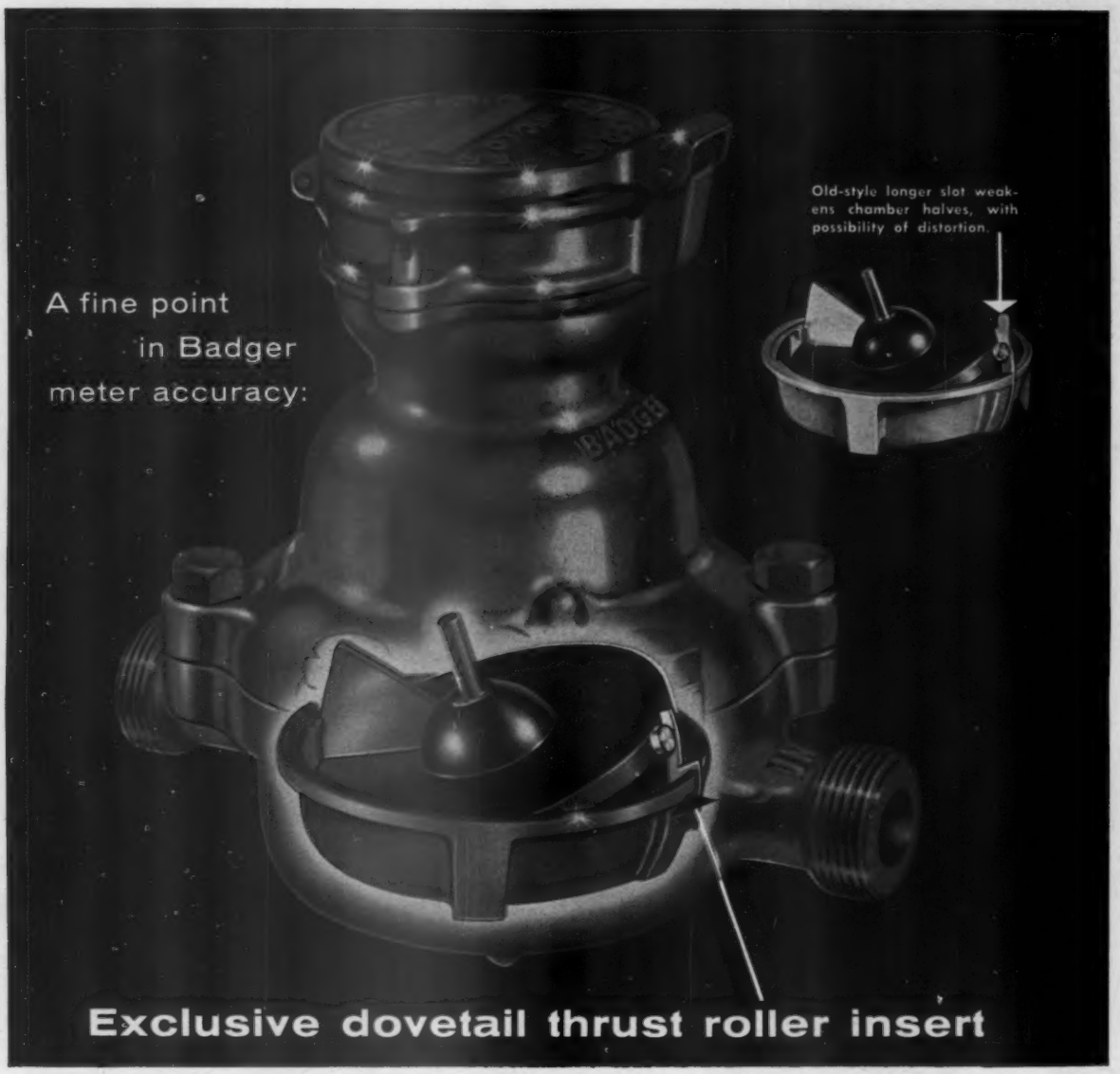
"Sure we got a low price on our pumps — 3% lower — but we're plenty sorry we didn't write an experience clause into the specs. We've had nothing but trouble and complaints since those pumps went into operation. Sure the manufacturer is cooperative. Why shouldn't he be. He's using *us* as a guinea pig on an untested design. I can't afford to be a testing department for every 'Johnny-come-lately.' I want pumps that *work*. Next time we'll have an 'experience clause.' When it comes to buying pumps . . . one burn is too many."

Reliability — one of the inherent qualities you get when you buy Allis-Chalmers. General Products Division, **Allis-Chalmers,** *Milwaukee 1, Wisconsin.*

A-1242

ALLIS-CHALMERS — 92 YEARS OF PUMP EXPERIENCE

Allis-Chalmers has a pump-building history going back over 90 years. In 1888, we developed the largest centrifugal pumps of that time . . . and they are still operating. Through a program of sound, gradual development, Allis-Chalmers pump designs are improved regularly with tested ideas . . . no idea goes into production for our customers until it has been proved sound in tests.


A fine point
in Badger
meter accuracy:
Old-style longer slot weakens chamber halves, with possibility of distortion.
Exclusive dovetail thrust roller insert

cuts wear and noise at the water level

It's standard on all Badger Disc meters. Dovetail thrust roller insert fits vertically into the thrust roller slot to form a smooth track on which the roller rides countless times — quietly without wear. With the slot 77% shorter, original strength is retained and possible distortion in this area is eliminated.

Accurate registration is constant because the nutating disc never shifts position. After many years of service an inexpensive insert can be replaced if necessary (instead of a possible chamber replacement).

The dovetail thrust roller insert is just one of many refinements to emerge from Badger's concentration on *meter* research and development. For further details, see your Badger representative. Ask him, too, about the new Read-o-Matic outdoor meter-register. Proof that answers for better water metering come first from Badger.

BADGER'S BIG PARADE OF PRODUCTS FOR BETTER WATER METERING

Badger Water Meters

BADGER METER MFG. CO. • 4545 W. Brown Deer Rd., Milwaukee 23, Wisconsin • *Offices in Principal Cities*

Equipment News

CONTINUED FROM PAGE 34A

Cartridge Valve Easily Removed Without Disturbing Lines

310

Allis-Chalmers Mfg. Co., Milwaukee, Wisconsin, has announced development of a new cartridge type butterfly valve designed for quick and easy replacement.

The cartridge unit consists of a standard butterfly valve in a wedge shaped body which is inserted in the outer body and held in place with the cover. Its flow characteristics are identical to the standard two flange valve.

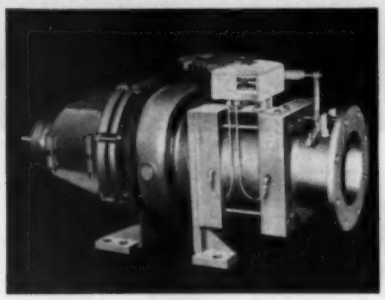
If necessary, the wedge shaped insert can be removed without disturbing the line flanges or the piping. The cover of the valve and the shaft extension accomodate standard manual, diaphragm, motor or cylinder operators.

Improved Pneumatic Control System

311

Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, has announced an improved pneumatic control system for its adjustable-capacity, adjustable-pressure (ACAP) pumps.

The new system, which automatically adjusts the cylinder of the sin-



gle-stage, single-suction pumps in seconds by air pressure, is designed to reduce installation and maintenance costs.

The improved design eliminated all gearing by building into the body the operating air cyclinder. The entire assembly then becomes a tubular shaft air cylinder, the flow to the pump impeller passing through this moveable hollow shaft. Increasing the air feed to one side of the piston moves the cylinder in or out to regulate recirculation and flow at the discharge nozzle.

Lubrication is by means of an oil mist lubricator located in the incoming air line. Double seals safeguard stock against possible contamination by air and keep liquid from entering the air chamber. The seal chamber is vented to the atmosphere and can be used to indicate the condition of the seals.

The simplified air control requires no gears or control motor. It speeds variations which meet head capacity requirements. The ACAP pump with its improved pneumatic control system is available in sizes up to 10-inch discharge and larger sizes will be considered.

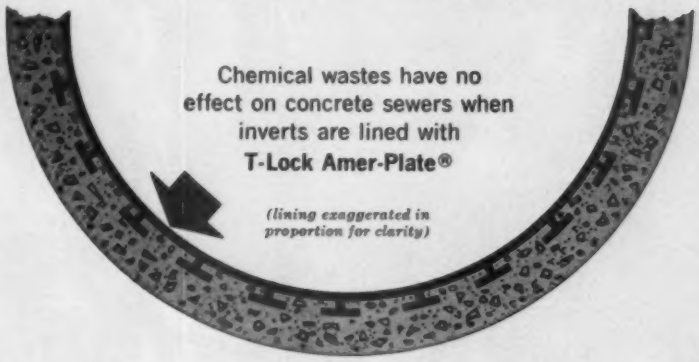
Pour-Easy Pail Rack

312

Hub States Chemical & Equipment Company, Indianapolis Ind., are offering a new and modern

CONTINUED ON PAGE 40A

How to Protect Concrete Sewers from Chemical Wastes


Chemical wastes have no effect on concrete sewers when inverts are lined with T-Lock Amer-Plate®
(lining exaggerated in proportion for clarity)

T-Lock Amer-Plate is a high polymer PVC sheet, easily cast into pipes, tunnels and structures to form a partial or complete 360° protective lining. Used in inverts, it permanently protects concrete from corrosive chemical effluents. In arch areas, it positively stops oxidized H_2S corrosion. T-Lock is also highly abrasion resistant; impartial tests show that it abrades at only 1/70th the rate of concrete.

The fact that T-Lock ends erosion and corrosion problems in industrial and municipal sewer systems is attested to by more than five million square feet now in use. Write for complete data on this maintenance-saving lining before designing your next sewer.

Applicators strategically located throughout U. S. and Canada

Amercoat® CORPORATION

Dept. WC • 4809 Firestone Boulevard • South Gate, California

921 Pitner Ave. Evanston, Ill. | 360 Carnegie Ave. Kenilworth, N.J. | 2404 Dennis St. Jacksonville, Fla. | 6530 Supply Row Houston, Texas

118

Ageless Concrete Pipe Installed Next to Ageless Arsenal Foundation For Pittsburgh Water Distribution

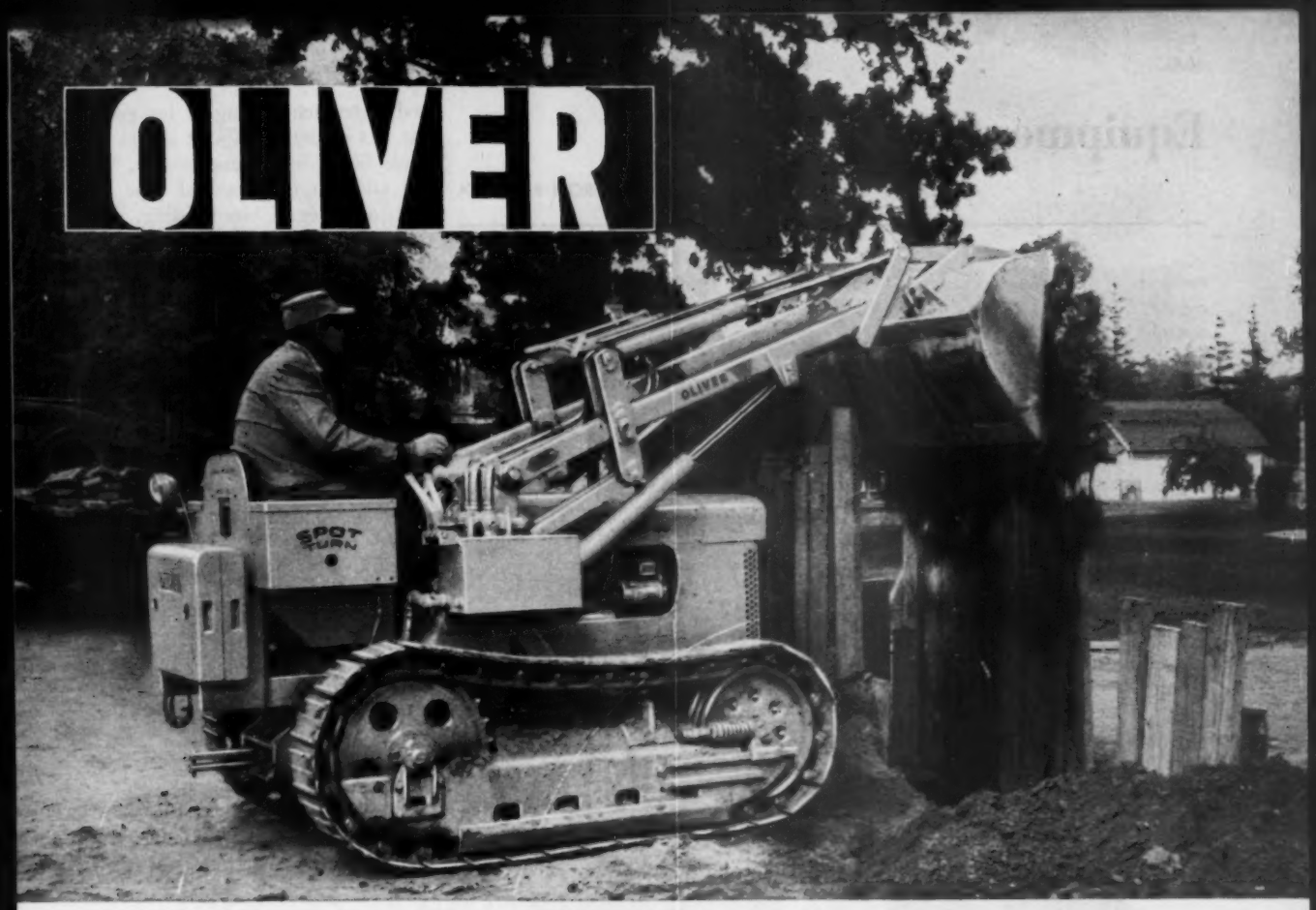
The building on the right is located at 40th and Foster Streets in the City of Pittsburgh and is part of the old Allegheny Arsenal built in 1814. Dig down alongside its foundation and you'll find it as good today as the day it was laid, unaffected by moisture or the elements of the soil. This foundation is built of a material that is ageless when buried underground—stone.

The pipe line being installed is made of another material unaffected by the soil—concrete. The longer concrete is buried underground, the harder and stronger it gets and the more it assumes the characteristics of the limestone from which it comes.

This pipe line will serve the City of Pittsburgh for a long, long time.

Prestressed concrete steel cylinder pipe was used for the 42-inch, 1680-foot-long line which was installed under the direction of John A. Murphy, Director, Morris L. Wolf, Chief Engineer, and John W. Bilotta, Distribution Division, Department of Water, City of Pittsburgh. Frank Kukurin & Sons, Inc., East McKeesport, Pa., was the contractor. The pipe was manufactured by Price Brothers Company, with headquarters plants at Hattiesburg, Miss. for the South and Dayton, Ohio for the North.

Price Brothers
CONCRETE PRESSURE PIPE



YOU GET MORE WORK FOR ITS SIZE...AND SPEND LESS FOR IT!

ask your Oliver distributor to prove it!

For an immediate step-up in work *and* work range, the Oliver OC-46 delivers the goods!

It's factory-built specifically as an integrated digging-loading machine with heavy-duty capabilities—a perfect match between tractor and loader. You get fast, full bucketloads quickly and easily—and hustle them through the cycle in jig time. Add Oliver "Spot-Turn" steering—diesel or gas power—and you have the machine that's built for more jobs and lower job costs.

The OC-46's practical, compact size lets you work along busy streets or in close quarters. With the fast-acting hydraulic backhoe you have the perfect package for sewer, water and utility installation and maintenance.

WORK-TEST IT! See what the OC-46 will do on your own work. Sample its production and you'll agree: it is today's best tractor buy! Call your Oliver distributor.

Have a look at this new tractor catalog on the OC-4 "Spot-Turn." It's filled with application pictures and data...shows many different work-speeding equipment changes! It's important reading for tractor users. Mail the handy coupon today!

THE OLIVER CORPORATION

Dept. 2232, 400 W. Madison St., Chicago 6, Ill.

a complete line of industrial wheel and crawler tractors and matched allied equipment

Please send me your new 16-page, color catalog on the OC-4 tractor. T21-3

Name.....
(Please print)

Company or Department.....

Address.....

City.....Zone....State.....

Equipment News

CONTINUED FROM PAGE 37A

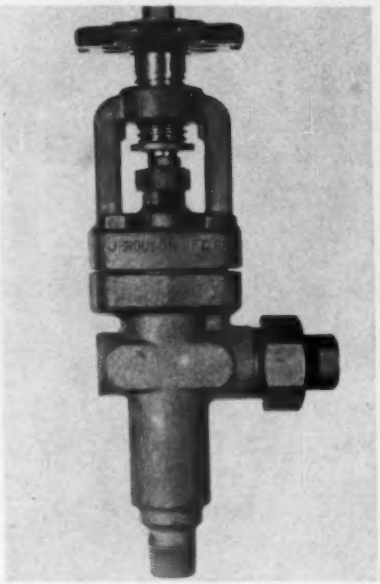
method of dispensing liquids from 5-gallon containers; a full, 5-gallon container of liquid weighs approximately 50 lbs. and is usually quite difficult to handle.

The Pour-Easy pail rack is a perfectly balanced container that eliminates costly waste of spilling. The clamping of a band, easily performed by tightening a plated wingnut, secures the container in a stand from which the container may be tilted for dispensing its contents.

Dual Purpose Angle Valve

313

Jerguson Gage and Valve Co., Burlington, Mass., has made available a new angle valve that may be used either for liquid level gaug'ng and instrument piping or for general use. As model No. 74, it serves as a basic liquid level gauge valve. With the addition of a special pipe plug with an integral bleed fitting, it becomes instrument valve No. 74G which is designed to eliminate multiple connections in instrument and general use.



The new valve has an A.S.A. rating of 1440 lbs. at 100° F., and a commercial rating of 4000 lbs. It weighs 8 lbs. and is available in various connections as well as various materials, including Teflon seating.

Packaged Chlorination

314

Precision Chemical Pump Corporation, Waltham, Massachusetts, has introduced a pump-tank assembly which supplies all the equipment needed for Chlorination in one packaged unit.

The assembly consists of Precision's new Model 801 hypochlorinator and a rigid self-supporting 50-gallon polyethylene drum. A durable solid PVC, bolted to the tank cover, serves as the pump mounting base.

Other features include a four-inch diameter cap plug that allows tank refueling, and stirring without removal of cover assembly and pump. All necessary tubing, foot valves, injection check valves and connections are supplied with the unit. It is also available with larger capacity Model S chemical pump.

CONTINUED ON PAGE 43A

control

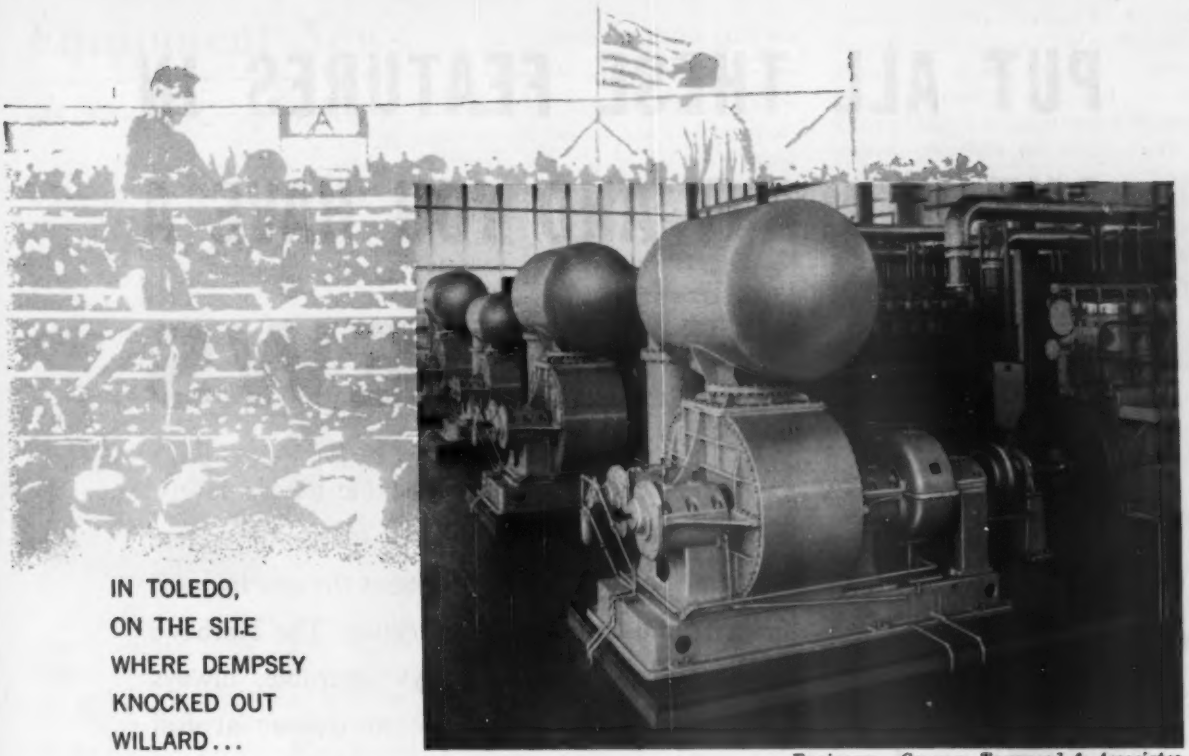
for algae and aquatic weeds

In small amounts, Triangle Brand Copper Sulfate controls algae growth and kills some of the more troublesome aquatic weeds. They disintegrate where they are, which prevents downstream infestation or clogged waterways.

In sewage pipes, Triangle Brand Copper Sulfate can be used in such low concentrations to control root and fungus growth that surface trees remain unaffected.

Two informational booklets, "The Use of Copper Sulfate in the Control of Microscopic Organisms," and "Copper Sulfate for Root and Fungus Control in Sanitary Sewers and Storm Drains," available on request.

Phelps Dodge Refining Corp.
300 PARK AVENUE, NEW YORK 22, N. Y.



IN TOLEDO,
ON THE SITE
WHERE DEMPSEY
KNOCKED OUT
WILLARD...

Engineers—Consoer-Townsend & Associates

ROOTS AERATION BLOWERS

PROVIDE THE "KNOCK-OUT" IN SEWAGE TREATMENT

Roots-Connersville equipment in the heart of the outstanding Toledo installation includes four large rotary blowers driven by Enterprise trifuel diesel engines and one Electric Machinery synchronous motor-driven blower. The Roots blowers supply a total of 80,000 cfm of air at 4 to 8 psi. Infinite control of the volume of air delivered to the aeration tanks is achieved through the use of multiple units which can also be operated at variable speeds.

Roots rotary blowers adapt uniquely to the Kraus process utilized in the Toledo Sewage Treatment Plant. The same blowers are capable of supplying the four pound (high level) or the eight pound (low level) aeration systems. The "load following" characteristic of rotary positive displacement blowers results in power savings and minimum operating costs.

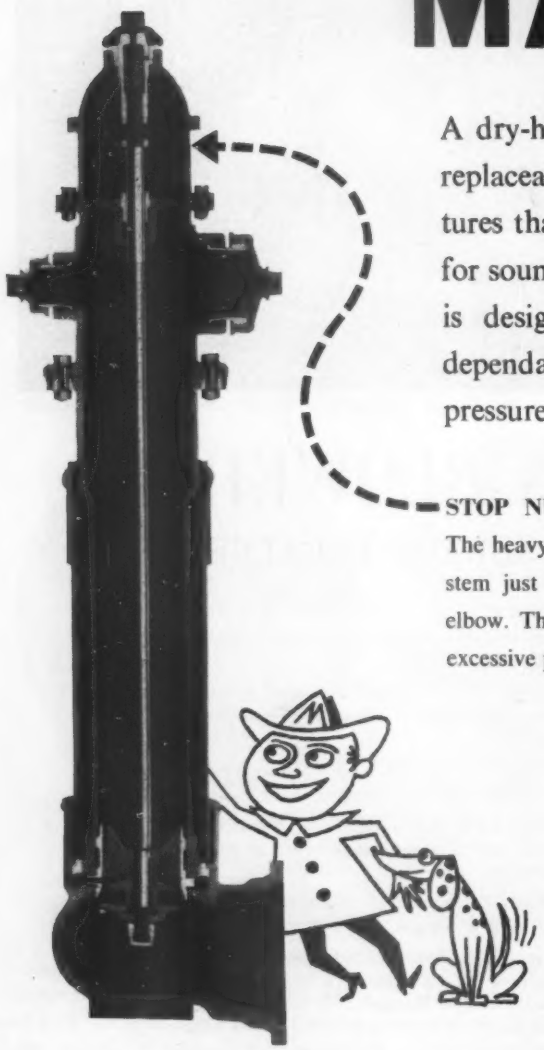
Design advantages of the Roots blowers selected for the Toledo plant include:

- SPEEDS—*conservative operating speeds contribute to quiet operation, low maintenance and long service life.*
- OPERATING ECONOMY—*horsepower requirements determined by actual operating pressure.*
- DRIVE FLEXIBILITY—*may be direct-coupled, belt-driven or geared to engines or electric motors.*
- CAPACITY RANGE—*wide selection of sizes up to 25,000 cfm for pressures to 10 psi.*
- CONSTANT VOLUME — *constant volume delivered regardless of temperature or pressure requirements.*
- EFFICIENCY — *high volumetric efficiency assured with minimum slippage.*

Additional data about Roots-Connersville equipment appear in Chemical Engineering Catalog and The Sewerage Manual. For design information and specification data covering Roots rotary or centrifugal blowers, gas meters and vacuum pumps write or call your R-C Field Engineer, or write for the following bulletins: *Rotary blowers* . . . Bulletin RAS-158 or Bulletin RB-154; *Centrifugal blowers* . . . Bulletin 120-B-14; *Vacuum pumps* . . . Bulletin VP-158; *Gas meters* . . . Bulletin M-258.

ROOTS-CONNERSVILLE BLOWER
A DIVISION OF DRESSER INDUSTRIES, INC.
360 Mount Ave., Connersville, Indiana. In Canada—429 Adelaide St., W., Toronto

PUT ALL THESE FEATURES IN ONE HYDRANT AND YOU HAVE A MATHEWS



A dry-head hydrant; adjustable nozzle levels; replaceable barrel—three of many major features that help make Mathews the one hydrant for sound community protection. The Mathews is designed to be always operable, always dependable, always ready to deliver at full pressure.

STOP NUT PREVENTS STEM FROM BUCKLING
The heavy bronze stop nut halts the downward travel of the stem just before the lower end touches the bottom of the elbow. This prevents any buckling stress on the stem when excessive pressure is put on the opening wrench.

AND ALL THESE OTHER FEATURES, TOO:
All working parts contained in replaceable barrel • Head can be faced in any direction • Replaceable head • Any nozzles you specify • Nozzle levels raised or lowered without excavating • Leakproof because stuffing box is cast integral with nozzle section • Operating thread only part requiring lubrication • Protection case of "Sand-Spun" cast iron for strength, toughness, elasticity • With bell, mechanical joint or flange pipe connections

Conform to latest AWWA specifications

R. D. WOOD COMPANY

Public Ledger Building, Independence Square, Philadelphia 5, Pa.

Manufacturers also of Mathews Flange Barrel Hydrants, R. D. Wood Hydrants, R. D. Wood Gate Valves, and "Sand-Spun" Pipe (centrifugally cast in sand molds)

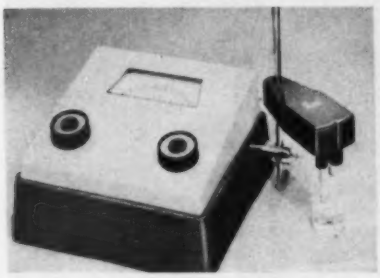
Equipment News

CONTINUED FROM PAGE 40A

pH Meter in Compact Case

315

Coleman Instruments, Inc., Maywood, Ill., is offering its new Metrion pH meter that is housed in a clean, compact, modern case, and which has a high resistance to shock, acids and strains.



Providing an extended range, the meter utilizes large, clear, duplex scales covering 0 to 10.0 pH and 4.0 to 14.0 pH. It also uses the Coleman screw base electrodes, but will accept all other modern pH electrodes as well. This convenient electrode mounting system adapts to titrations and a wide range of sample volumes.

New Types of Plastic Pipe

316

Keasbey and Mattison Company, Ambler, Pa., is offering "one-stop purchasing of both asbestos-cement pipe and plastic pipe" with the recent introduction of its four types of plastic pipe. The new types of pipe are: ABS (Acrylonitrile Butadiene Styrene); Normal-Impact PVC (Polyvinyl Chloride); Polyethylene; and High-Impact, Styrene-Alloy sewer pipe.

Among the many uses of this pipe are: utilities, municipal water and home sewer work, irrigation, industrial applications, large lawn and golf course irrigation, and other similar installations.

Available in 10 and 20-foot lengths, the pipe may be cut cleanly with a handsaw, and its section are readily joined by means of a solvent weld. Other features include its relatively light weight and its breakage resistance.

B.O.D. Incubator

317

The Electric Hotpack Company, Inc., of Philadelphia, Pa., announces the production of a new incubator designed for standard B.O.D. Determination Tests. It has a temperature range of 5°C. to 50°C, and a sensitive hydraulic thermostat responds instantly to temperature change. This provides control within plus or minus 0.5°C. of desired temperature setting. The door mounted dial thermometer permits instant visual readings without upsetting interior environments.

A built-in air circulation system insures uniform thermal levels over the entire temperature range. Its compressor is sealed into chip proof, enameled steel cabinet, and the interior chamber is constructed of steel with a porcelain enameled overlay. Both right and left door openings are available. The unit can be slid under a counter or table top to conserve work space. The control panel, recessed at cabinet's base, permits toe space and has plexiglass cover to protect it against damage and, in addition, it discourages unauthorized adjustment.

the V-notch

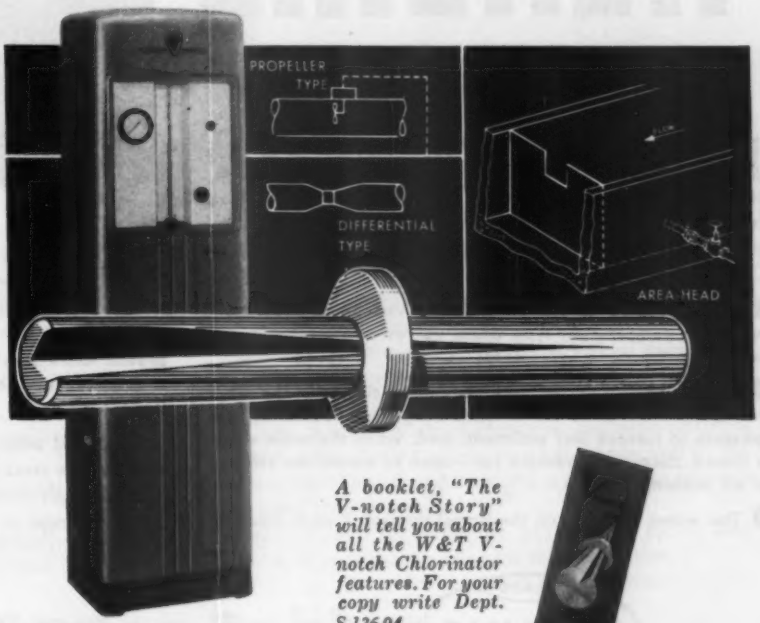
ready and waiting for your signal

Lots of jobs are done better automatically. Changing chlorine feed rate is now one of them. With the V-notch... the straight line metering action of the plug through the ring makes automation simple.

Merely by adding, not adapting, a W&T V-notch Chlorinator can give you any degree of automatic control you want—step rate, start-stop, program, proportional, even residual control.

With a V-notch Chlorinator any signal from any primary metering device can control chlorine feed. So anyone can afford automation.

And, of course, the right plastics make the whole chlorinator chlorine-proof.



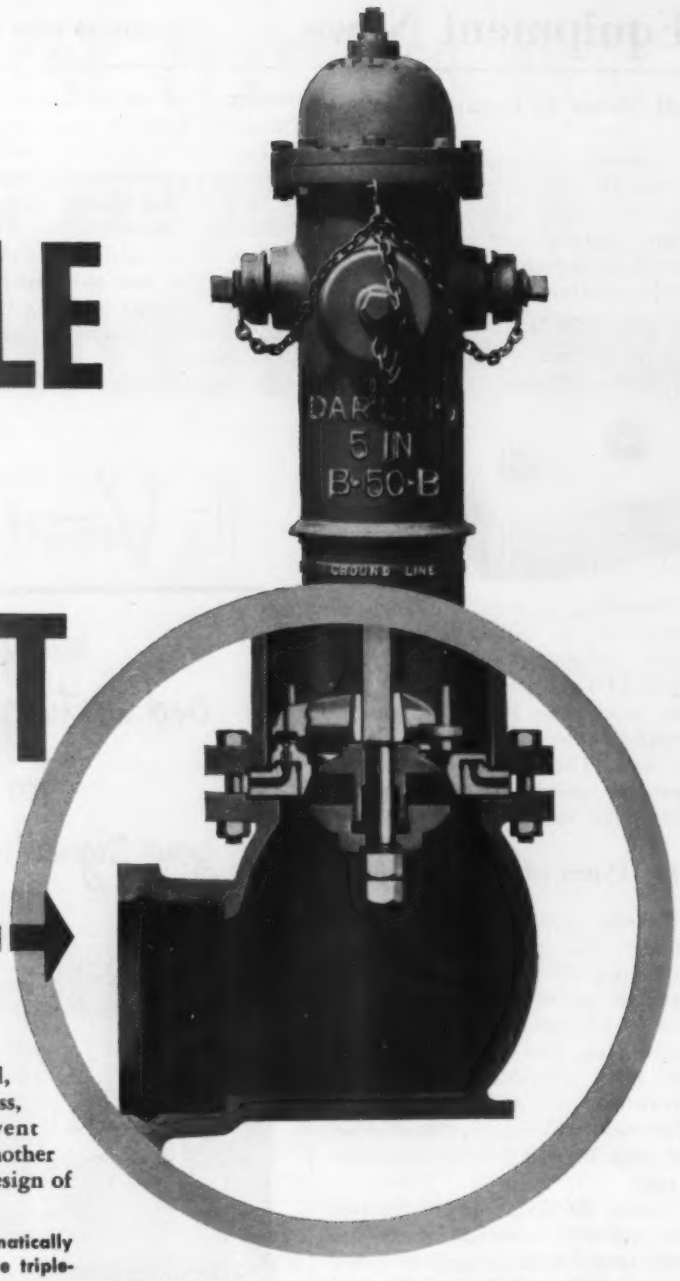
A booklet, "The V-notch Story" will tell you about all the W&T V-notch Chlorinator features. For your copy write Dept. S-136.94.

WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

In Darling Hydrants

TROUBLE CAN'T COLLECT HERE....



EVER SINCE modern fire hydrants were invented, designers have aimed, with more or less success, at positive, complete water drainage to prevent freeze-ups, corrosion and binding. And this is another successful feature of major importance in the design of Darling hydrants. Consider...

1 An unmatched safety factor is assured by automatically operated, compression type drain valves and unique triple-porting in the main valve seat!

2 For an interval during each opening or closing of the main valve, the drain ports are automatically force-flushed by line pressure to remove any sediment. And, when the main valve is closed, these ports remain fully open to assure the release of all remaining water.

3 The water drains from the barrel through 3 ports into the bronze drain ring which has 10 to 18 ports to allow water to escape into the ground and eliminate all possibility of clogged drains.

This and other equally important Darling design features are your assurance of the smoothest, surest, safest hydrant operation known today. For all details, including the range of types and sizes, ask for Bulletin 5710.

TRADE DARLING MARK

DARLING VALVE & MANUFACTURING CO.

Williamsport 11, Pa.

Manufactured in Canada by The Canada Valve & Hydrant Co., Ltd., Brantford 7, Ont.

Naugatuck KRALASTIC

Underground corrosion steals $600,000,000 a year!* but KRALASTIC ABS pipe can't corrode

It can't rust or rot—is free from electrolytic action—impervious to water and the usual soil elements—highly resistant to most chemicals. Pipe made of KRALASTIC®, the original ABS rubber-resin, never needs coating, lining or anode protection.

What's more, amazingly tough KRALASTIC pipe gives a host of other advantages over conventional pipe materials.

- KRALASTIC pipe is extremely lightweight—needs no heavy handling equipment or costly bedding.
- It can be snaked through many existing lines—eliminates much time- and money-wasting ditching.
- It offers extremely low internal friction—will not accumulate scale.
- It can be quickly and easily solvent welded—by relatively unskilled workers. Or it may be threaded and used with threaded fittings.
- KRALASTIC has outstanding impact strength—even at arctic temperatures.

In short, KRALASTIC is a noncorroding pipe material with a combination of properties no other pipe material can match.

Proof of KRALASTIC pipe performance? More than 9,000 miles of KRALASTIC pipe have been specified, installed and are now in trouble-free service carrying potable water, brine, gas, a wide variety of chemicals and even electrical wire and cable. KRALASTIC pipe has been approved by the National Sanitation Foundation and is already accepted in many local plumbing codes.

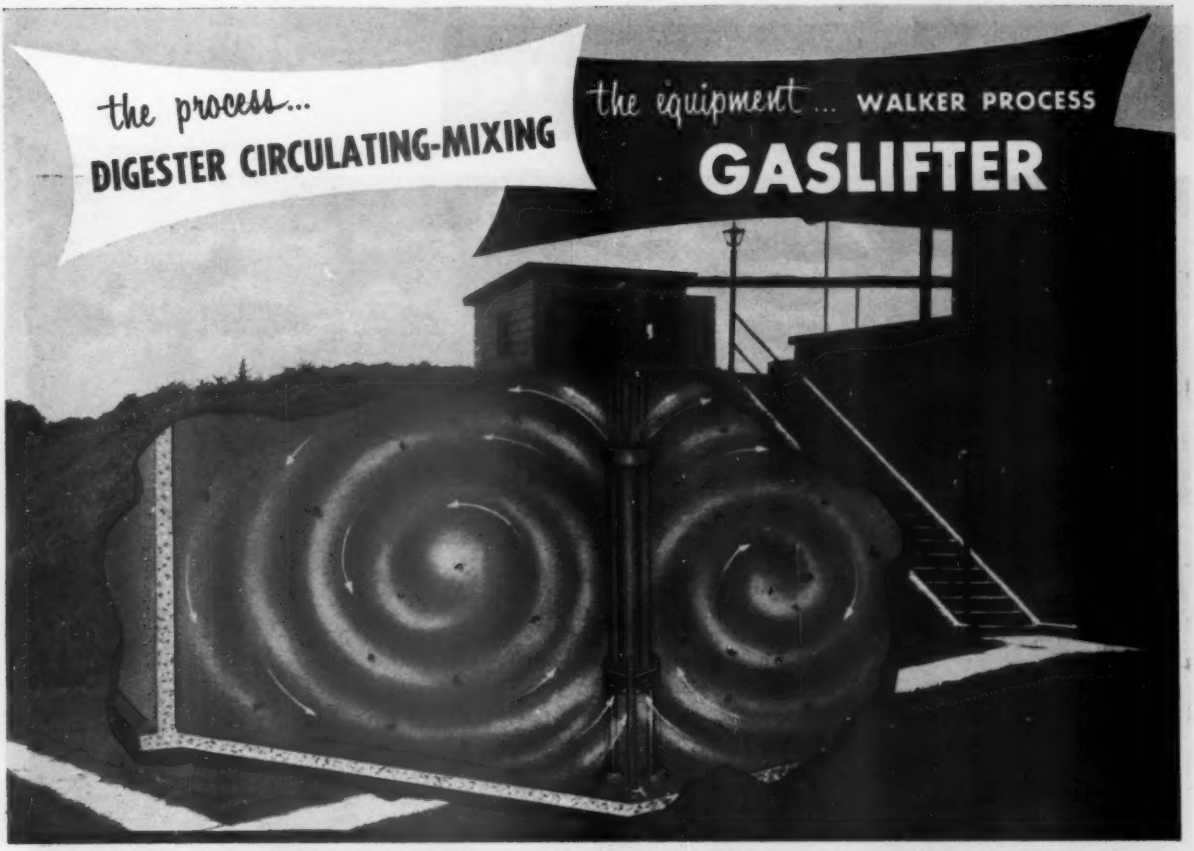
Better look into KRALASTIC, the original ABS, today. Simply write on your letterhead to the address below.

*Estimate of the National Bureau of Standards

United States Rubber
Naugatuck Chemical Division
354K ELM STREET
NAUGATUCK, CONNECTICUT

KRALASTIC RUBBER-RESINS • MARVINOL VINYLS • VIBRIN POLYESTERS

Akron · Boston · Chicago · Gastonia · Los Angeles · Memphis · New York · Phila. · CANADA: Naugatuck Chemicals · Elmira, Ont. · Cable: Rubexport, N.Y.



GASLIFTER UNIT

DIGESTER CIRCULATOR-MIXER

INCREASED CAPACITY—GASLIFTER circulated digesters easily handle loadings of 6 lbs. of solids/cu. ft./mo.

BETTER DIGESTION—15 to 20% more gas (methane) per lb. of volatile solids, together with low and uniform volatile acids—all accomplished in single stage digestion at high loading rates.

ELIMINATES SCUM BLANKETS AND GRIT SHOALS—Rapid circulation along roof, walls and bottom disperses grease blanket and prevents loss of capacity due to grit shoaling.

ADAPTABLE TO STANDARD OR HIGH RATE DIGESTION—The GASLIFTER may be applied to either standard or high rate digesters with equally efficient results.

ACCESSIBLE—SPECIALLY DESIGNED LOCKING CHAMBER permits individual inspection and service of stainless GASLIFTER sparging units without dangerous gas loss or digester shutdown.

NO MECHANICAL SHUTDOWNS—GASLIFTER utilizes gas-lift principle and completely avoids mechanical troubles from rag and sewage "string" fouling. Sparjers used to diffuse gas in the eductor tube avoid all orifice troubles.

GASLIFTERS incorporate the patent rights of Joseph Cunetta

Above—Installation at Aurora Sanitary District, Aurora, Illinois serves to illustrate circulation and mixing action achieved with GASLIFTER. Published operating data attests to the resulting increased efficiency.

Walter A. Sperry
Supt., Aurora Sanitary District
Walter E. Deuchler Co., Aurora
Consulting Engineers

Engineers will be interested in Bulletin 25-S-91 for details on GASLIFTERS: and Brochure 25-S-11336 for complete report on GASLIFTER operating results at a full scale plant installation. *Write for your copies.*

GASLIFTER is a trademark of Walker Process Equipment Inc.

WALKER PROCESS

WALKER PROCESS EQUIPMENT INC.
FACTORY • ENGINEERING OFFICES • LABORATORIES
AURORA, ILLINOIS

Wedge-Lock®

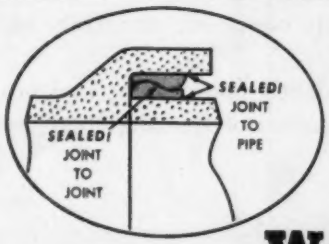
THE JOINT
with the

Full Circle
OF
PROTECTION

MINIMUM INFILTRATION!

ROOT-TIGHT SEAL!

FAST INSTALLATION!



When you install Vitrified Clay Pipe with Wedge-Lock Factory-Made Joints, you leave nothing to chance. Wedge-Lock pre-cast Joints are bonded to bell and spigot . . . snap together instantly . . . seal the entire circumference of the pipe to reduce infiltration and resist roots. Always specify Wedge-Lock, your Full Circle of Protection against infiltration . . . root problems . . . job delays . . . ultimate high cost resulting from costly repairs or maintenance.

Write to listed manufacturers for literature or an actual Wedge-Lock demonstration

Wedge-Lock CLAY PIPE

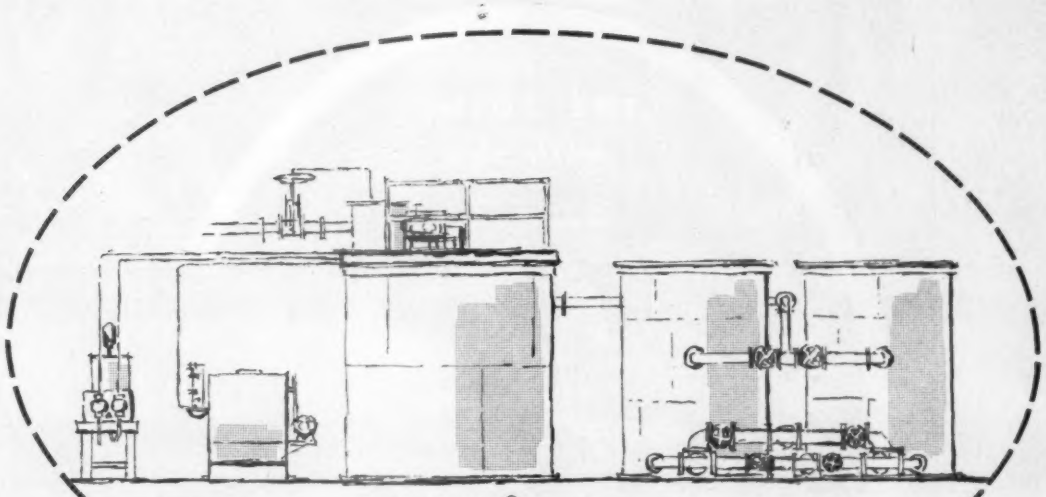
THE FACTORY-JOINTED CLAY PIPE AVAILABLE NATIONALLY FROM LOCAL MANUFACTURERS

Order Wedge-Lock from any of these Vitrified Clay Pipe Manufacturers:

Cannelton Sewer Pipe Company..Cannelton, Ind.
The Clay City Pipe Company....Uhrichsville, Ohio
The Evans Pipe Company.....Uhrichsville, Ohio
Graff-Kittanning Clay Products..Worthington, Pa.
Larson Clay Pipe Company.....Detroit, Mich.
The Logan Clay Products Company..Logan, Ohio
The Robinson Clay Product Co......Akron, Ohio
The Stillwater Clay Products Co...Cleveland, Ohio
Superior Clay Corporation.....Uhrichsville, Ohio

WLC-159-160-A

A complete "package" water treating plant...



the

ACCELAPAK®

plant

COMPLETE—from inlet to outlet—nothing else required.

ADAPTABLE—for clarification, softening, iron or color removal, and sterilization. Pressure or gravity filters, as required.

STANDARDIZED—pre-engineered in all sizes with standardized dimensions in capacities from 15 to 350 gpm.

SIMPLE—working parts, easily accessible for minimum required attention. Simple erecting and operating instructions.

DEPENDABLE—treatment results are easily obtained; uniformly and dependably maintained.

ECONOMICAL—costs of plants are low due to quantity purchasing and production; installation space is small; maximum utilization of treating chemicals is assured.

9401

Write today for full details on the "ACCELAPAK" plant in Bulletin 1870-A or request Bulletin 80 showing our complete line of water and waste treating equipment.

INFILCO

INFILCO Inc.

General Offices, Tucson, Arizona

Field offices throughout the United States and other countries.

quickly installed in old piping!

MUELLER® copper meter yokes

NEW compression couplings

...for steel or copper pipe

...with or without locking nut

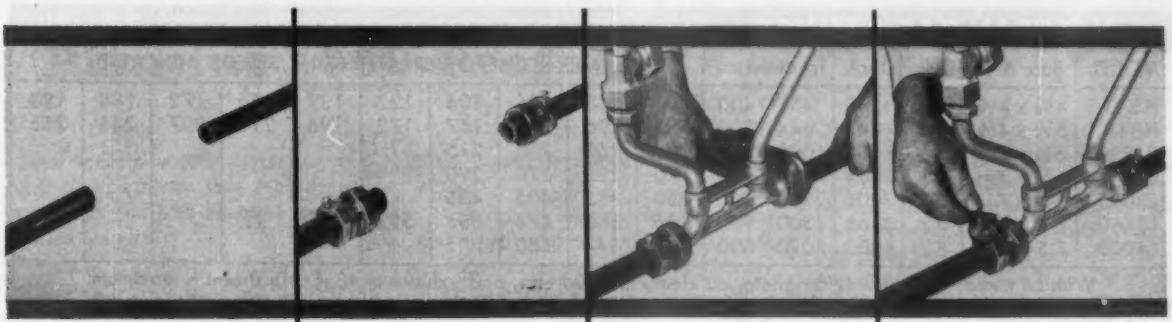
You can now install Mueller Copper Meter Yokes in any existing steel or copper piping in just a few minutes — and without cutting threads or sweating joints.

The simple step-by-step procedure for installing a yoke with Mueller's new Compression Couplings is shown below. Permanent, water-tight joints are quickly made even on rough and badly pitted pipe. Possible trouble is avoided because the piping does not have to be moved.

These new, time-saving couplings are now available for all Mueller Copper Meter Yokes with Multi-Purpose Ends. Regular compression nut or locking nut designs can be furnished for steel or copper pipe.

The locking nut type (shown) positively prevents any movement of the yoke on the pipe and insures continuous electrical bonding of the service piping.

Write for complete information and specifications on Mueller's Copper Meter Yokes.



1 Clean dirt, rust and scale from pipe and cut out a section just slightly longer than yoke (without coupling).

2 Remove all burrs from inside and outside of pipe and slip complete coupling over cleaned ends of pipe.

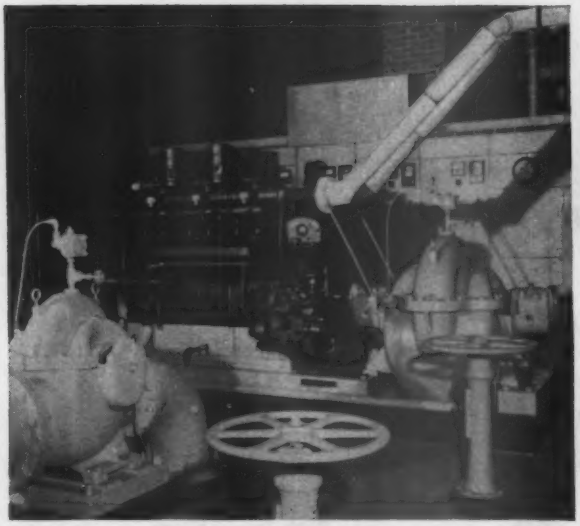
3 Align yoke between ends of pipe, slide couplings into place and tighten couplings securely onto yoke body.

4 Tighten compression nuts on pipe and lock yoke in place by tightening locking set screw on clamp. Setting complete.

Copper Meter Yokes are just a portion of Mueller's complete line of quality-matched meter setting equipment.

MUELLER CO.
DECATUR, ILL.

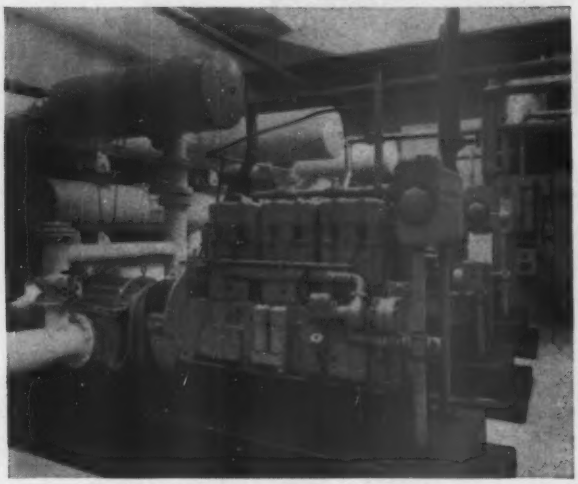
Factories at: Decatur, Chattanooga, Los Angeles;
In Canada: Mueller, Limited, Sarnia, Ontario.



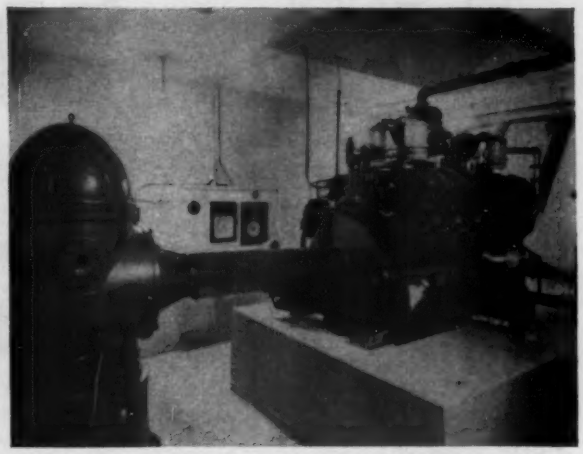
EAST—North Stamford, Connecticut—water pumping system.

All over the country, municipal and utility plants use ROILINE engines in water supply systems, waste disposal services, and for power generation. Operating on natural or LP gas, or gasoline, ROILINES have been standard in the field for many years.

ROILINE ENGINES



MID-CONTINENT—Waste disposal power in Enid, Oklahoma.



WEST—Rivera, California—deep well pumping power.

NATURAL GAS RATINGS					600	800	1000	1200	1400	1600	1800	2000	2200	2400
MODEL	Bore & S.	Cyls.	Displ.	Torque–rpm	BRAKE HORSEPOWER AT ENGINE SPEEDS INDICATED									
H570	4⅝ x 4¼	8	570	457-1400	...	68	86	104	122	139	156	172	188	198
H844	5¼ x 4⅞	8	844	644-1200	...	96	121	147	172	196	219	237	248	256
F1500	6¾ x 7	6	1503	1090- 600	125	165	200	215						
H2000	6¾ x 7	8	2004	1490- 650	170	225	270	290						
L3000	6¾ x 7	12	3006	2200- 700	250	335	405	435						
L3460	7¼ x 7	12	3468	2500- 900	285	380	474	555	592 @ 1350					
L4000	7.54 x 7.5	12	4000	3020- 600	345	447	550	635						

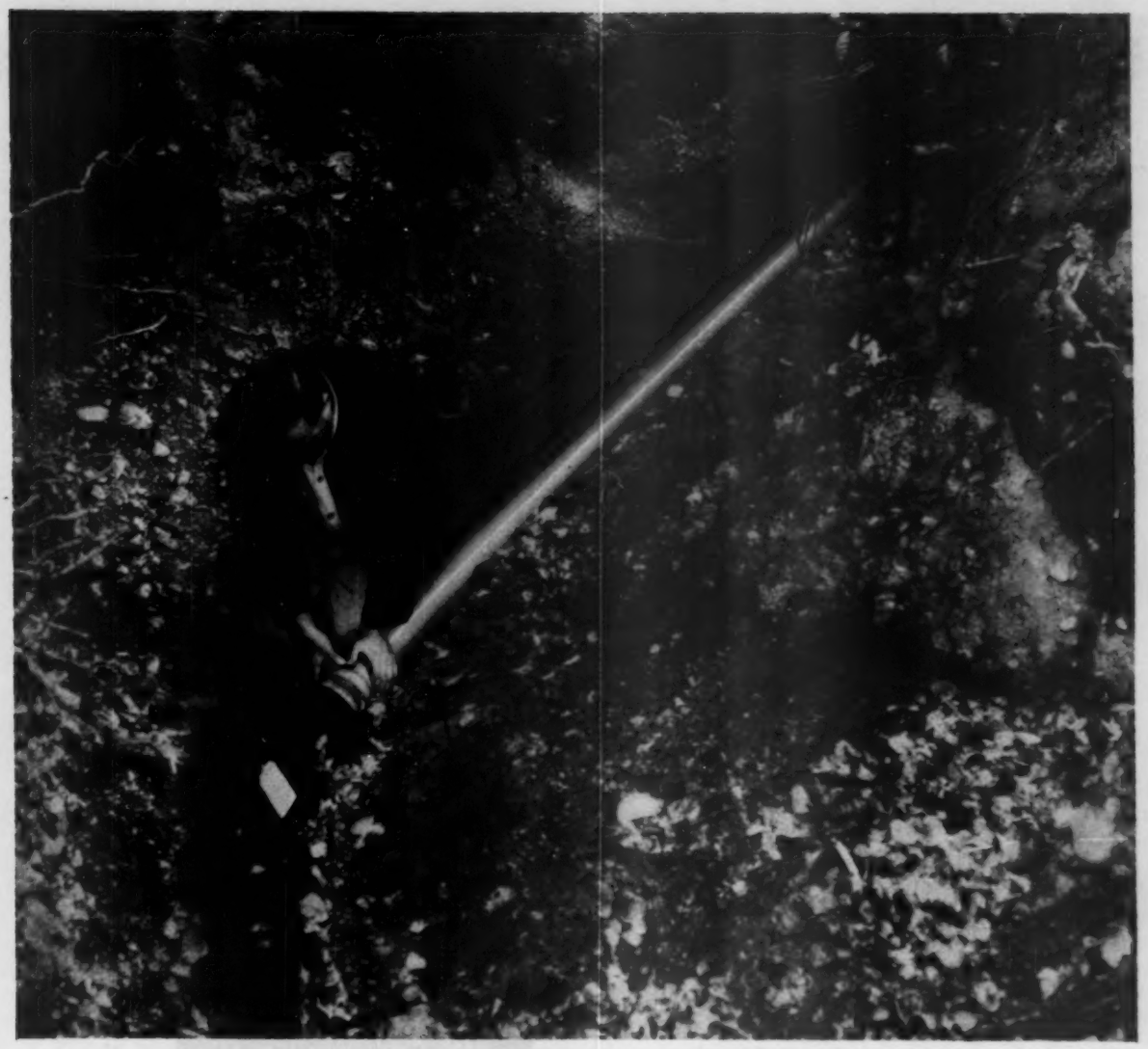
With oil pump, water pump, magneto, air cleaner, carburetor, and exhaust muffler. Hp shown is maximum.

Send for Literature • *SEE YOUR ROILINE ENGINE DISTRIBUTOR*

ARIZONA, Casa Grande, Engine Service Company, Inc.
ARKANSAS, Paragould, Wonder State Manufacturing Co.
CALIFORNIA, Long Beach, Engine & Equipment Company
COLORADO, Denver, Emrick & Hill Engine & Equipt. Co.
KANSAS, Garden City, Carson Machine & Supply Co.
LOUISIANA, New Orleans, Southern Engine & Pump Co.
MICHIGAN, Reed City, Hafer Engine Company
NEW YORK, Syracuse 6, J. C. Georg Corporation
OHIO, Columbus 19, Cantwell Machinery Company
OKLAHOMA, Oklahoma City 9, Carson Machine & Supply Co.
PENNSYLVANIA, Bradford, R. R. Reck Company
TEXAS, Houston 1, Southern Engine & Pump Co. (also in Beaumont, Corpus Christi, Dallas, Edinburg, Kilgore, San Antonio)
Lubbock, Farmers Supply
Odessa, General Machine & Supply, Inc.
Wichita Falls, Nortex Engine & Equipment Co.
WYOMING, Casper, Emrick & Hill Engine & Equipt. Co.

471

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS. / **New York • Tulsa • Los Angeles**
Factories: Waukesha, Wisconsin and Clinton, Iowa



Planting 1980 Profits

Your financial success... your revenue and rate problems this year depend partly on the cost of replacing pipe buried long ago.

So will it be in the year 1980... and 2000. Your costs *then* will depend on the quality of the piping and planning you do *today*.

Look *now* to proven new materials: Tough, durable plastics... corrosion-proof, non-fouling plastics... pure, non-toxic plastics developed specifically for water.

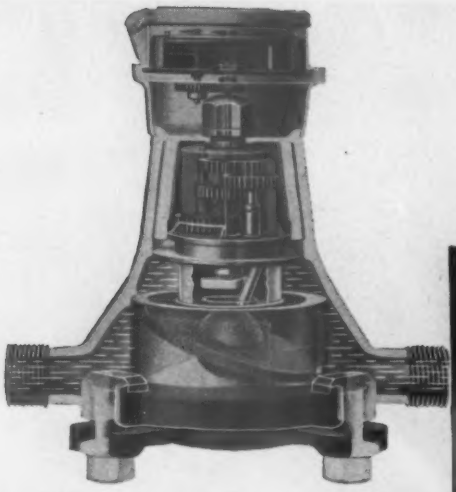
And use all the experience you can find when applying these cost-saving materials... experience in depth only American Hard Rubber Co. can offer.

The first Ace plastic pipe was installed over 50 years ago (hard rubber was the *first* plastic). Some of this pipe is still at work! Now *seven types* of Ace pipe are used by water and sewage utilities... led by Ace Riviclor®, Ace-Ite® and Ace Supplex® for chemical feed lines, water mains and service lines. Thousands of Ace rubber-lined treatment tanks, valves, pumps, fittings and molded parts are in use. We are also leading suppliers of hard rubber precision parts for water meters.

Put this unparalleled water works experience to work for you... for the future of your community... with Ace plastic pipe.

Ace-Ite®, Ace Riviclor® and Ace Supplex® are approved for drinking water.

ACE RUBBER & PLASTICS EQUIPMENT
BY AMERICAN HARD RUBBER COMPANY
DIVISION OF AMERACE CORPORATION
ACE ROAD • BUTLER, N. J.



HOW TO DEVELOP MORE

EFFICIENCY

IN YOUR METER SHOP

When a meter man learns one Trident, he learns them all. Instead of spreading his knowledge thin over many types and models of household meters, he can concentrate on the fine points of just one, and can quickly learn to do a job of which he can be proud.

Trident interchangeability is the big reason. Parts made for the most up-to-date Tridents are designed to fit into any older Trident of the same size and type. Reordering and stock control are simplified, too. No need to keep parts for many models. Just stock a small supply of the latest Trident parts.

You need never scrap a Trident because it is a "discontinued" model. In the process of replacing work-worn parts with new, improved parts over the years, you actually modernize all the Tridents in your system.

This 50-year policy of Trident is your best assurance that the modern Tridents you buy today will earn maximum revenue for your utility . . . with lowest yearly costs . . . for many years to come. Standardize on Trident meters. It pays in many ways.

It takes money to maintain the water supply your community expects. It's vitally important to make sure all the water pumped is paid for . . . by using accurate meters . . . and by keeping these meters in good repair.

205

NEPTUNE METER COMPANY
19 West 50th Street • New York 20, N. Y.
NEPTUNE METERS, LTD.
1430 Lakeshore Road • Toronto 14, Ontario
Branch Offices in Principal American and Canadian Cities.

neptune
TRIDENT WATER METERS

Vol. 107, No. 3 • March, 1960

A Scranton Gillette Publication

WATER & SEWAGE WORKS

An unusual sewage with a requirement for a high degree of treatment is the problem in . . .

Sewage Treatment for Turnpike Service Areas

by HENRY W. HAUENSTEIN, Junior Partner
Finkbeiner, Pettis and Strout
Consulting Engineers
Toledo, Ohio

EDITOR'S NOTE: With the turnpikes came the problem of treating the somewhat unusual sewage discharged from their service areas. This sewage has high concentrations of detergents and grease, a BOD which ranges from 250 to 380 mg/1, and other typical characteristics. To further complicate the situation these service areas are by design located away from both a sewer system and a significant stream. Drawing on the experience of the earlier turnpikes the author's firm designed a quite interesting little plant for the Ohio turnpike. All eight installations on this pike required a plant which would produce a highly treated effluent at minimum cost and with a minimum of supervision. It was necessary first to develop the design criteria for the plants as well as what type of plant to design. How these problems were met and the results of four years of operating experience is reported here.

■ ON THE OHIO TURNPIKE, 16 restaurant and service station areas have been provided. At each location, dual facilities have been constructed on each side of the highway. Each pair of restaurants and service stations is served by common water and sewerage systems. Thus there are eight separate systems, which are located at intervals of approximately 30 miles.

In selecting the route of the Ohio Turnpike, the bypassing of urban areas was a prime consideration, which is typical of all toll roads. This resulted in the restaurant areas being located, in most cases, considerably distant from municipal water supplies and sewage treatment plants.

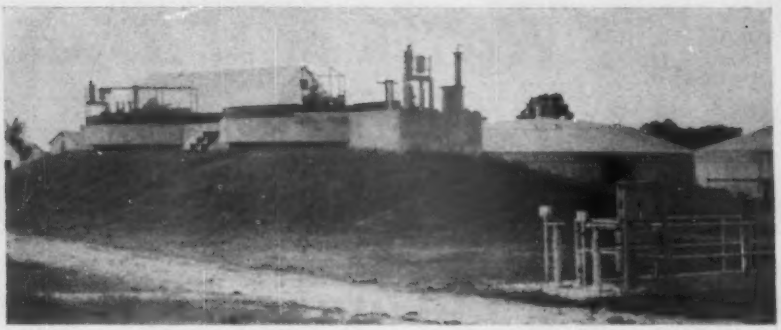
In two cases however, it was possible to make provisions to connect to municipal water systems, those of the Villages of Amherst and Swanton. At the six other locations, well water supply systems were installed. At no location was it possible to utilize a municipal system for sewage disposal. Thus, the construction of a sewage plant was required at each of the restaurant areas.

Because each restaurant area requires entrance and exit lanes on each side of the turnpike and because streams require bridges, the restaurant area locations were selected so that they would not be adjacent to major streams, thus eliminating the necessity for providing two additional lanes on bridge structures. This made necessary the installation of sewage treatment facilities providing a high degree of treatment in all cases. In seven of the eight locations, the receiving stream consisted only of a ditch or an intermittent stream.

Previous Experience

In 1954, when design of the Ohio Turnpike sewage treatment plants was undertaken, experience with facilities treating primarily restaurant wastes in the volumes contemplated was relatively limited. Comparable restaurant facilities had been installed on the Pennsylvania Turnpike and the New Jersey Turnpike. The original sewage treatment facilities in Pennsylvania, which were constructed in 1941, consisted of grease traps, septic tanks and sand filters. The original New Jersey installations consisted of septic tanks and covered leaching filters or tile fields.

All of the original installations had proved to be unsatisfactory and at approximately the time that the Ohio Turnpike plants were being de-



TWO OF THE COVERED TRICKLING FILTERS with the final pumping station and weir chamber in the foreground.

signed, the original Pennsylvania and New Jersey installations were in the process of being replaced or abandoned. Sand filters had been found to be unsatisfactory because the grease and detergents in the wastes had clogged the filters and necessitated frequent replacement of the top layers of sand. Odors, flies and freezing of the filters had also presented serious problems. Similar problems had been encountered at the New Jersey installations.

The difficulties experienced on the Pennsylvania and New Jersey Turnpikes were convincing proof that wastes discharged from the kitchens and toilet and wash rooms of the service areas were unlike normal sanitary sewage and that conventional methods of sewage treatment could not be utilized. It was also evident that sewage flow volumes could not be computed upon conventional per capita volume of flow bases.

Fortunately, the facilities on the Pennsylvania Turnpike were available to evaluate for the purpose of obtaining a basis of design. The Pennsylvania toll road was used instead of the New Jersey Turnpike, since it was felt that experiences on the Ohio Turnpike should be more similar to those on its neighboring highway than to the New Jersey data.

Design Criteria

A number of the original Pennsylvania stations were operating at maximum capacity and these had been used as a basis of study in the design of replacement facilities on the Pennsylvania Turnpike. Water supply records were used to determine flow data. The most pertinent data which came from the Pennsylvania studies were design flow criteria related to restaurant seating facilities. The average total flow from both restaurants and toilet and wash rooms was established as 350 gallons per day per counter seat and 150 gallons per day per table seat.

These quantities were used as the basis of design for the Ohio Turnpike facilities in addition to the new plants on the Pennsylvania Turnpike and were also used in the design of sewage treatment plants for the Northern Indiana Turnpike.

Since all of the eight service areas, each consisting of two restaurants and service stations, were to be identical in size and design, the eight sewage treatment plants were designed on the basis of the same number of table and counter seats and thus are identical in capacity. It was recognized that it was probable that some of the facilities would never reach the design capacity because of varying traffic volumes on the various sections of the toll road, but it was felt that this result was far better than to design the plants on the basis of an estimated traffic volume and to find one or more of the plants overloaded in a few years. Because of the type of design selected, oversizing of the units was relatively inexpensive and not detrimental to operation; expansion of the facilities would on the other hand be relatively costly.

With the Pennsylvania Turnpike results used as background data, the actual average flow selected for design purposes was 100 gpm, which included an approximate 20 percent factor of safety over the 350 gpd per counter seat and 150 gpd per table seat basis. Maximum-day average flows were assumed to be 175 percent of the average flow and peak flows were assumed to be 350 percent of the average flow. It was expected that there would be periods of time when there would be virtually no flow.

It was anticipated that BOD concentrations would be 500 mg/l, or somewhat over two times that of normal domestic sewage. The suspended solids concentration was assumed to be approximately that of normal sewage, or 250 mg/l, producing a population equivalent of 1,500 persons, at 0.20 pounds per capita per day. Among the most troublesome aspects of the sewage were the expected grease and detergents contents of the kitchen wastes. Concentrations of up to 100 mg/l were anticipated in each of these two categories. Based upon the experiences in Pennsylvania, the sewage would also be much warmer than usual.

Treatment Method

In all considerations in determining the type of facilities to be installed the governing factor was that the sewage treatment plants should offer the least difficulty in operation, in order to minimize personnel requirements. Although the facilities were to be constructed by the Ohio Turnpike Commission, operation of the plants would be the responsibility of the restaurant concessionaire at each of the sites. Inasmuch as operation of the sewage treatment plant would represent an item of overhead for each concessionaire, it was only natural that manpower allocation to plant operation would be held to a minimum.

It was also considered that any operating difficulty encountered would almost certainly be multiplied by eight. For these reasons, although every consideration was given to minimizing initial cost without sacrificing any of the benefits to be achieved in operation, the factor of initial cost was deemed to be secondary to obtaining sewage treatment plants which could be operated easily and with a minimum of expense.

Three basic types of installations were considered. These were: Sand filters, Activated sludge and Trickling filters. In addition, consideration was given to utilization of separate sludge digestion versus modified Imhoff tanks.

Sand filters were discarded immediately because their ineffectiveness had been proved on the Pennsylvania Turnpike. It was conceded that, with adequate preliminary treatment and with modifications such as covering the filters, sand filters could perhaps have been utilized. However, since enclosed sand filters would be extremely expensive because of the large area involved and because sand filters do not offer much flexibility in operation, sand filters were deemed to be less desirable than trickling filters.

Activated sludge was discarded for several reasons. It was felt that activated sludge plants would require more control in operation, thus additional manpower requirements, over trickling filters. The problem of frothing was recognized and was not deemed to have been solved at the time, particularly considering the anticipated high detergents concentration. The ability of activated sludge to successfully treat the anticipated wastes was questioned. Activated sludge was rejected, however, somewhat reluctantly, since it was felt that the process could eventually be adapted to effectively handle service area wastes. However, the time to prove the ability of activated sludge was not available, nor was it deemed wise to construct eight "experimental" plants. Thus, activated sludge was also deemed less desirable than trickling filters and the latter were selected as the basic method of treatment.

It was also recognized that conventional standard rate trickling filters would not be completely satisfactory, inasmuch as they would not provide the solution to the filter fly and freezing problems; nor was it probable that they would provide sufficient BOD removals to satisfy the requirements of the receiving streams. For this reason, two-stage filters were selected, with recirculation at a fixed rate. Recirculation was to be applied to the primary filter through the primary settling facilities and directly to the secondary filter. In this way, continuous dosage of both filters would be obtained.

Trickling filters, however, would not solve the grease and detergents problem, so provision had to be included in the primary treatment facilities, or by pretreatment, to remove these constituents. Fortunately, by the fall of 1954, the new facilities on the Pennsylvania Turnpike had been in use for several months. These new facilities were being operated by introducing the raw sewage into the digester, or in reality to the digestion compartment of the mechanical Imhoff tank, thus providing anaerobic digestion of the grease and detergents.

THE CONTROL BUILDING WITH THE PRIMARY and final settling tanks to the right

The initial period of operation in this manner indicated that predigestion might completely eliminate surface scum from the primary settling compartment of the tank. This would greatly assist in odor control. In addition, the BOD concentration was being substantially reduced in the unit.

In order to minimize potential septic conditions in the settling portion of the tank, particularly during periods of low flow, recirculation of the primary filter effluent through the settling compartment was deemed necessary.

The combination of sedimentation, with pre-digestion, and two-stage trickling filters, with recirculation, seemed to offer the rugged process necessary to handle the concentrated and complex sewage anticipated; it offered simplicity in operation without the complexities of separate sludge pumping and without the necessity of pretreatment for grease removal. This process was, therefore, adopted.

Plant Units

The sewage treatment plant constructed at each of the eight service areas consists of the following units:

Table I

Design Criteria

Average Flow	—100gpm,
Recirculation Flow	—100gpm,
5-Day BOD	—500mg/l, and
Suspended Solids	—250mg/l (1,500 persons,),

Control Building, housing the comminutor, raw sewage pumps, recirculation pumps, wet wells and chlorination facilities. The building superstructure is of brick, designed similar to the main service plaza buildings. In all cases, the sewage treatment plants are in close proximity to the restaurant areas.

Two Clarigesters, each 18 ft in diameter, which are operated in parallel. The settling compartments are 7 ft deep and the digestion compartments, 14 ft deep. Each unit is provided with a wood cover to minimize any possible odor problem and to maintain warm temperatures during cold weather.

Two Trickling Filters, each 48 ft in diameter, by 6 ft depth of filter media, operated in series. Each filter is covered with a reinforced concrete dome, with glass block skylights and ventilated through a louvered gravity ventilator. Although it was believed that odors from the trickling filters would not present a significant problem, the domes were provided to eliminate any possibility of odors and to prevent freezing of the filters. By covering the filters from view, the domes also improved the sewage treatment plant appearance and removed the psychological problem of imaginary odors being experienced by people who have only to see sewage being distributed on filters to smell disagreeable odors.

Final Settling Tank, 16 ft sq, by 10.75 ft total water depth. The tank is constructed with a hopper-bottom. Sludge is drawn through a telescoping sludge valve into a sludge box and is returned to the raw sewage wet well.

Chlorine Contact Tank, 8 ft by 5 ft, by 7 ft water depth, for chlorination of the plant effluent. Chlorine is ap-

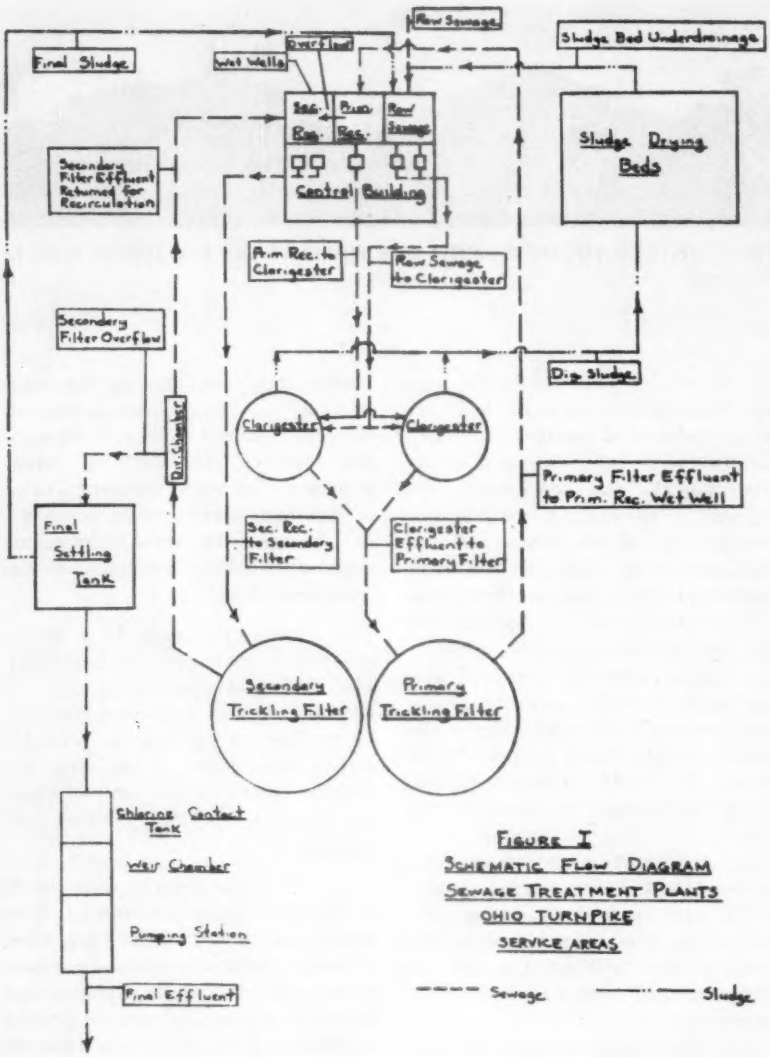


FIGURE I
SCHEMATIC FLOW DIAGRAM
SEWAGE TREATMENT PLANTS
OHIO TURNPIKE
SERVICE AREAS

plied by means of a gas chlorinator, which also applies chlorine, if required, into the raw sewage pump discharge line for pre-chlorination.

Weir Chamber. A V-notch weir is provided on the plant effluent with a hook-gage, but a meter is not included. Sewage flows are determined from the service area water meters.

Final Pumping Station. Because of variable topographic conditions, three of the sewage treatment plants provide for pumping of the plant effluent to the receiving stream and five provide for pumping of sewage to the final settling tanks.

Two Sludge Drying Beds, each 20 feet by 40 feet; open beds. Sludge bed underdrainage is returned to the raw sewage wet well.

The raw sewage pumps are of 100 gpm and 300 gpm capacities. The final pumps are of the same capacities. Operation of both the raw sewage pumps and final pumps is automatically controlled by the sewage levels in the wet wells.

The primary recirculation pump is 100 gpm in capacity and is manually started and stopped.

The secondary recirculation pumps are of 200 gpm and 300 gpm capacities. The 200 gpm pump is manually operated and the 300 gpm pump is interlocked with the 300 gpm raw sewage pump, so that when the latter pump is in operation, the 300 gpm secondary recirculation pump also operates. The two 300 gpm pumps are also interconnected so that the recirculation pump can be used as a raw sewage pump in case of emergencies. All pumps are vertical centrifugal pumps.

When the 100 gpm raw sewage pump is in operation (Fig 1) both the discharge from this pump and the 100 gpm primary recirculation pump reaches the primary filter. At the same time, the 200 gpm secondary recirculation pump discharges to the secondary filter. Thus, the recirculation ratio on both filters is 1:1. However because the volume of application is fixed, the recirculation ratio exceeds 1:1 when average raw sewage flows are less than 100 gpm and is less than 1:1 when flows exceed 100 gpm.

Sewage reaches the sewage treatment plant by gravity from both the restaurant areas, passes through the comminutor and enters the raw sewage well (Fig 1).

The raw sewage pumps discharge to either of two outlets in the digestion compartment or to an outlet in the flow compartment of each combined settling digestion tank. The effluent of these units flows by gravity to the primary filter.

The primary filter effluent flows to the primary recirculation wet well, from which sewage is recirculated by the primary recirculation pump to the flow compartment of each of the settling digestion tank and thence to the primary trickling filter.

Sewage overflows from the primary recirculation wet well to the secondary recirculation wet well at a rate equal to the raw sewage flow. From the latter wet well, the secondary recirculation pumps discharge the sewage to the secondary filter.

The secondary filter effluent flows to a diversion chamber, from which sewage overflows to the final settling tank at a rate equivalent to the raw sewage flow. The remainder returns to the secondary wet well. From the final settling tank the plant effluent flows to the chlorine contact tank and thence to the receiving stream.

On the basis of tables 1 and 2 it was estimated that the plant effluent would have a BOD concentration of approximately 20 mg/1.

The construction cost of each of the sewage treatment plants varied with local conditions, including rock excavation in some cases. The exact

cost of each plant is not known since lump sum bids were received for the facilities including the water supply systems. However, the estimated cost of each sewage plant was approximately $200,000, including the collection sewers from the restaurant areas.

Operating Results

Each of the sewage treatment plants has now completed four years of operation. Table 3 includes a complete analysis of operating results for the year 1957, which is typical of the four years of operation.

The results are interesting in a number of aspects. The average flow for the eight plants was 0.034 mgd, or 24 gpm. This is substantially less than the design flow, which indicates that all plants are operating at only a fraction of capacity and that the recirculation ratio is on the average of approximately 4:1 on the primary filters and 7:1 on the secondary filters.

Complete daily flow results are not available, but at one site the maximum average daily flow was 370 percent of the yearly average and the minimum 20 percent of the yearly average. The average raw sewage BOD was 250 mg/1, or one-half of the design concentration, although at one plant the concentration was substantially higher, 384 mg/1. The average raw sewage suspended solids was 223 mg/1, or approximately the design concentration.

Because of the relatively low loadings on the plants, removals are substantially higher than anticipated. The average BOD in the effluents was 5 mg/1, varying from 1 mg/1 to 10 mg/1. The average suspended solids concentration in the effluents was 11 mg/1. All plants produced an effluent high in dissolved oxygen, the five plants reporting averaging 8.8 mg/1. Removals averaged 98 percent BOD and 95 percent for suspended solids.

Some of the plants are operated with raw sewage being discharged to the flow compartment of the settling digesting tank, others with the discharge to the digestion compartment. The difference in results obtained from the two methods does not appear to be significant at the present time.

Analyses are not made for grease

Table 3

OHIO TURNPIKE SEWAGE TREATMENT PLANTS—OPERATING RESULTS—1957

Location Near	West Unity	Swanton	Woodville	Clyde	Amherst	Bracksville	Freedom	New Springfield	Average
Sewage Flow-mgd									
Average Day	0.024	0.034	0.035	0.041	0.037	0.030	0.032	0.039	0.034
Maximum Month	0.041	0.055	0.054	0.069	0.055	0.047	0.059	0.065	0.056
Minimum Month	0.014	0.013	0.023	0.023	0.028	0.019	0.015	0.026	0.020
Maximum Day	0.054	0.126	—	0.102	0.071	—	—	—	—
Minimum Day	0.006	0.007	—	0.014	0.014	—	—	—	—
BOD mg/l									
Raw Sewage	244	239	217	320	384	196	192	205	250
Effluent	5	6	10	4	9	2	1	1	5
Suspended Solids mg/l									
Raw Sewage	240	258	126	244	304	210	199	204	223
Effluent	12	12	5	15	31	3	4	3	11
DO mg/l									
Raw Sewage	1.8	2.0	4.5	5.0	3.4	—	—	—	3.3*
Effluent	8.1	8.1	8.3	10.4	9.0	—	—	—	8.8*
Loadings lb/dy BOD									
Raw Sewage	48.5	67.6	63.3	109.0	119.3	49.0	51.1	66.8	70.9
Effluent	1.0	1.7	2.9	1.4	2.8	0.5	0.3	0.3	1.4
Suspended Solids									
Raw Sewage	48.0	72.9	36.8	83.3	93.8	52.5	53.1	66.5	63.1
Effluent	2.4	3.4	1.5	5.1	9.6	0.7	1.1	1.0	3.1
Population Equiv. of Raw Sewage									
BOD	290	405	379	653	716	294	306	400	425
Suspended Solids	240	364	184	415	469	262	265	332	315
Removals									
BOD	98	97	95	99	98	99	99	99	98
Suspended Solids	95	95	96	94	90	99	98	99	95

* 5-Plants Only #BOD at 0.167 lb/cap/dy; Suspended Solids at 0.20 lb/cap/dy

Table 2
Unit Loading

Combined Settling Digesting Tank
Digestion Capacity—4.7cf/capita,
Surface Overflow Rate—568 gpd/sf,
Digestion Capacity—4.7 cf/capita,
Total Detention (Including Digestion Compartment)—400 minutes;

Primary Trickling Filter
Hydraulic Loading—159 gpd/sf;
BOD Loading—55.5 lb/1,000 cf/dy (1.5 lb/cy/dy);

Secondary Trickling Filter
Hydraulic Loading—159 gpd/sf;
BOD Loading—14.4 lb/1,000 cf/dy (0.39 lb/cy/dy);

Final Settling Tank
Detention—127 minutes,
Surface Overflow Rate—841 gpd/sf;

Chlorine Contact Tank
Detention—21 minutes

Sludge Drying Beds
Capacity—1.1 sf/capita.

and detergents concentrations, but these constituents have not produced significant problems.

Odor problems have not been reported and pre-chlorination is not utilized in any of the plants. A chlorine residual is maintained in the plant effluents in all cases.

Sludge is withdrawn from the digestion compartment approximately five times per year. It is reported to be well-digested and dries readily.

A minimum amount of attendance is required at the plants. The plants are operated by employees of the restaurant concessionaires, but operators from nearby municipalities, certified by the Ohio Department of Health are retained as supervisors.

The initial four years of operation have produced evidence that the operating results of the plants have satisfied the initial expectations and that the plants should continue to produce acceptable effluents well into the future.

Equipment Suppliers

Dorr-Oliver, Incorporated—Clarigester mechanisms and rotary distributors;
Chicago Pump Company—Comminutors (5 sites);
Inflilco, Incorporated—comminutors (3 sites);
Weinman Pump Manufacturing Company—sewage and recirculation pumps;
Fisher and Porter Company—chlorinators (6 sites);
Wallace and Tierman, Incorporated—chlorinators (2 sites);
Bowerston Shale Company—filter underdrains.

Interstate Conference on Water Problems

At its Second Annual Meeting held January 28-30, in Chicago, the Interstate Conference on Water Problems elected Harvey O. Banks, director of the California Water Resources Department, as its chairman for the coming year. In addition, five resolutions on state's water policies were passed during the meeting.

The Conference is a continuing organization of state officials concerned with water resources, and its purpose is to enable states to give mutual assistance in solving water problems through exchange of information.

At the three-day conference, attended by 110 water resources engineers and administrators from 39 states, these resolutions were passed:

1. Major state responsibility is to develop a water policy directed toward orderly and sound development of the state's water resources, and each state must provide an adequately financed and competently staffed agency or agencies for this purpose.

2. Immediate enactment of federal legislation to clarify present uncertainty and confusion in the matter of state water rights, particularly with regard to reserved and withdrawn lands.

3. Uniform standards urged for the financial evaluation of water resources development projects by all federal agencies, and the coordination of federal activities with proper state water agencies, both in research and development.

4. Federal government should participate financially in non-federal water development projects to ensure features in the national interest, such as flood control, recreation and wildlife.

5. Recreational benefits should be an integral part of planning and evaluation for multipurpose federal water projects.

Other officers elected for the coming year are: Robert L. Smith, executive secretary of Kansas Water Resources Board as first vice chairman; Sam Thompson, chairman of Mississippi Board of Water Commissioners as second vice chairman; William C. Ackermann, chief of Illinois State Water Survey as secretary-treasurer.

Cook Named to Division Post in BDSA

James B. Cook, Jr., sales manager, General Products Division, Hays Manufacturing Co., Erie, Pennsylvania, was recently named Assistant Director for Mobilization Planning of the Water and Sewerage Industry and Utilities Division, Business and Defense Services Administration, U. S. Department of Commerce.

Mr. Cook comes to BDSA under an arrangement by which industry makes executive personnel available for temporary assignment without compensation from the Government. The assignment also will equip him for service in the National Defense Executive Reserve which staff the operation of a production agency in event of national emergency.

He entered the water and sewerage industry field with B-I-F Industries, Providence, in 1939, transferring in 1948 to their manufacturer's representative, the C. I. Thornburg Company, Inc., Huntington, West Virginia. In 1956 he resigned as vice president and sales manager of Thornburg to take his present position.

After one hundred and ten years, more water required by the . . .

Charlottesville, Virginia Water Works

by C. G. HANEY,
Superintendent of Filtration,
Charlottesville, Va.

EDITOR'S NOTE: Like many another community, Charlottesville, Va. has had to lift its water supply literally by its own bootstraps. Mr. Haney's story sums up the century-long struggle and reports the need for yet another dam-site.

■ THE HISTORY of our water works goes back prior to the Civil War, when the town was served by private scattered springs and wells. The people carried water in pails to their homes. The town owned one well, now covered with the Lewis Clark statue.

In the 1850's a small dam was built at the foot of Lewis Mountain and a 2½" pipe carried the water to a small lake at the site of the present gymnasium. From this lake a covered canal conveyed the water to a steam-driven pump, which lifted it to a tank in the top of the Rotunda, providing gravity flow to the professor's homes. This water was not used for drinking. The operator of this pump had a stick tied to a float—by looking out his window he could observe the stick and operate the pumps accordingly, although on several occasions he must have failed to shut the pump down.

In 1868 the wells were being closed from pollution and the water problem was indeed bad. At this time a one-half million gallon reservoir was built on Observatory Mountain and a 4" cast iron pipe brought this water to the Rotunda.

In June 1871 the council agreed to pay $25.00 towards the repair of one pump, and contracted for the use of another well at a cost of $48.00.

In 1873 a committee recommended the employment of an engineer to devise a plan for the securing of a pure and abundant supply of water. In April of the following years an engineer was retained, but nothing came of this movement.

In 1884 another engineer was hired and a report on location of the dam-site, pipes and other facilities was made. A contract was entered into with the University of Virginia wherein the University was to pay about one sixth of the total cost, since the University was by this time as badly in need of water as was the town. An earth-filled dam was built, (Fig. 1) three miles west of town at Ragged Mountain. The dam was 45 feet in height and formed a reservoir having a capacity of 182 million gallons. Supplied by a few small springs, it has drainage area of 300 acres. A 10" cast iron pipe

FIG. 1. DAM and 182 mg reservoir at Ragged Mountain.

FIG. 2. TOP OF DAM at Moorman's River.

FIG. 3. UPSTREAM VIEW of Moorman's River Dam.

line connects this reservoir with the town.

For a few years the town enjoyed an abundance of water and in 1888, the city fathers removed the charge on water for bath tubs. This must have been a popular edict with the citizens. However, a few dry seasons must have changed the picture for in 1891, the University laid a 6" pipe line to the reservoir, and in 1893, a small dam was built near Moore's Creek and Maury Branch about two miles below the reservoir to catch the leakage, and run off in the intervening two miles. Two steam pumps were installed to pump this water back into the reservoir.

With the increased use of water in the 1880's and the adoption of more up-to-date and more numerous plumbing fixtures, the problems of sanitary conditions, and the disposal of sewage presented itself. In 1893, the services of a well known engineer, Mr. Rudolph Herring of New York, were employed. A study was made and the sanitary system installed under his direction.

A few of the water rates in 1898 are very interesting. The following rates are annual:

Dwellings valued at less than $10,000	$ 5.00
For each $100 valuation add	.15
For laying brick 10c per thousand brick	
Bathing establishments	25.00
Hotels (without water closets)	40.00
Water closets in Hotels and Public places, first seat	8.00
Each additional seat	5.00

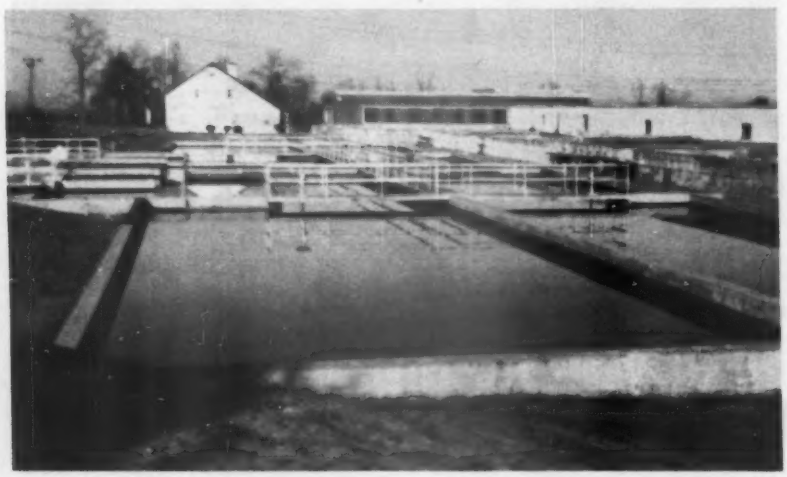


FIG. 4. VIEW of filter plant. Note superintendent's residence, upper left.

In 1904 the Mayor made this report, "The most important matter for the council to consider is the water question. Its importance is so great that it cannot be magnified or exaggerated. I would suggest that you avail yourselves of the service of local or other expert service in solving this problem to the end of a wise issue of this important matter".

In 1906, a new dam was constructed just below the Ragged Mountain Dam. This reservoir is known as the Lower Reservoir or Mayo's Rock Dam. It is a concrete structure of the usual gravity section and 60' high. The capacity of the reservoir is 433 million gallons, and has a drainage area of two square miles. From this reservoir an 18" cast iron pipe conveys the water to the city.

These two reservoirs took care of the demand for quite a few years. However a combination of increased demand, and dry seasons depleted these reservoirs to such a point that the growth of algae, and other organisms resulted in a most unpalatable water. In 1920, the New York firm of Hazen, Whipple and Fuller made a study of the situation. In 1921 Williamson, Carrol and Saunders of Charlottesville, together with Fuller and McClintock designed a 2.0 mgd slow sand filter plant. This plant took care of the quality but not the quantity of water, so in 1923 Fuller and McClintock made a most through study of six sources. The Moorman's River Water shed was used. A small intake dam was built at the foot of the Blue Ridge Mountains and an 18" cast iron pipe 13½ miles in length was installed connecting with the 18" line at the lower reservoir. The drainage area of this watershed is about 18 square miles. The capacity of the 18" Moorman's River gravity line is approximately 4.8 mgd. When the demand for water is below the flow in the 18" main, the excess is diverted into the Ragged Mountain Reservoir. Normally these reservoirs will not fill from the run-off of this watershed.

From the completion of the Moorman's River project in 1925 to 1930, the city enjoyed perhaps the most quiet period of its water works history. During the unusual drought in 1930, the city installed a 3.0 mgd pump on the 18" line at Mechum River. This pump was never used.

The filtration plant, built in 1922

FIG. 5. VIEW of filter floor showing control console.

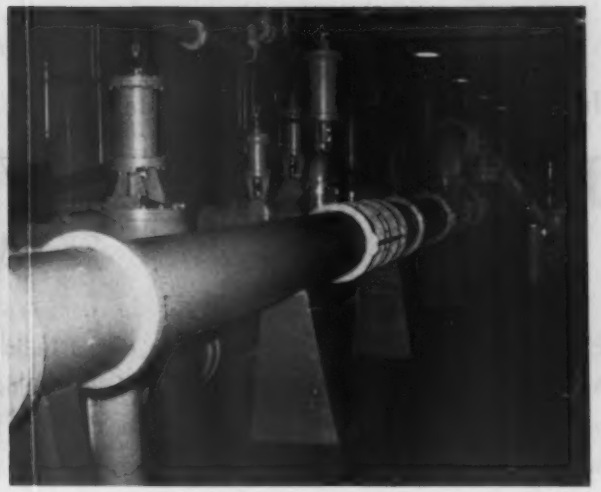


FIG. 6. SECTION of pipe gallery showing effluent controllers.

was increased in capacity in 1936 by the addition of a ¾ mgd unit. In the 1940's another ¾ mgd unit was added, giving a total of 3.5 mgd plant capacity. At the filtration plant, we have a one-million and a two-million gallon finished water reservoir.

These facilities were satisfactory until 1946, when raw water storage became inadequate. In order to provide additional storage, a 75" arch concrete dam was built upstream from the Moorman River intake dam. (Figs. 2, 3) This reservoir has a capacity of 430 million gallons.

In 1949 the engineering firm of Wiley and Wilson, Lynchburg, Virginia, designed a chemical treatment building, mixing, flocculation, and settling basins for 5.5 mgd. These units were put into operation in 1950. The raw water is very low in turbidity, for other characteristics see table 1.

In coagulating this water we use alum lime and activated silica, prepared continuously from sodium silicate and chlorine in a Silactor*. In the summer we find it impossible to form settleable floc without the addition of this coagulant aid. Coagulants are not required during the winter months when all the reservoirs are full.

When the treated water was applied on the slow sand filters, we soon found out that slow sand filters were not designed to operate on the water from the coagulation basins. The very small amount of floc carried over would seal the sand. The sand size was 0.3 mm. So we had solved one problem and created another and at the same time the demand had exceeded the slow sand rate.

In 1952 the firm of Wiley and Wilson was employed to design a 5.0 mgd rapid sand filter plant. This plant was completed in 1954. At this time we used the new plant to its designed capacity and the slow sand plant only when the demand exceeded 5.0 mgd. During 1954 and each year since we have exceeded a 7.0 mgd demand. In order to eliminate the cost of manual washing the slow sand filters, we had the rate controllers on the rapid sand filters rebored to deliver 4.0 gpm. The slow sand filters were discontinued and converted to secondary settling basins.

TABLE I

Total alkalinity	8-	14	ppm
Total Hardness	8-	14	ppm
Total Iron	0.1-	0.4	ppm
ph		6.7	
Total Solids, maximum		50.0	ppm
Color	5.0-	150.0	ppm

* Except during times of heavy run off due to rain or snow

(Fig 4). Fig 5 shows part of our filter floor, while Fig 6 is a view of the pipe gallery.

Water from the Moorman's River Reservoir flows by gravity to the filtration plant. Water from the Ragged Mountain Reservoir has to be pumped, due to the level of these reservoirs being approximately 40' lower than the filtration plant.

In order to take care of the demand in case of a broken raw water main, an 18" concrete lined cast iron pipe was installed from the plant to the Ragged Mountain Reservoir. On this line we have a 2800 gpm pump. With our piping arrangement at the Ragged Mountain Station, we can use any source of water in any combination of the lines from there to the plant.

As usual at the present we are making a survey to find an additional source of raw water, and a dam site.

*Product of Wallace and Tiernan, Belleville, New Jersey.

W & SWM Association P. R. Program

This is the first of a series of cartoons focusing on what has been called "the worst public works problem." These cartoons are being sent

to 2,000 weekly newspapers as part of a service sponsored by the Water and Sewage Works Manufacturing Association, Public Relations Program.

Indiana Section hears about up-to-date water works, automation, and sees . . .

Indianapolis win AWWA Advancement Award

A STAFF REPORT

EDITOR'S NOTE: At the recent meeting of the Indiana Section AWWA, a well rounded program of panel discussions, formal papers, and awards provided a very informative and interesting meeting. Some of the papers presented are abstracted here.

■ THE INDIANAPOLIS WATER Company won the AWWA Advancement Award, with Gary H. Hobart placing second and Muncie third. All presentations of the programs were available for examination in the registration room during the meeting.

The Fuller Award was won by Claude Williams, Sr., and a life membership was awarded to H. W. Niemever, of Indianapolis.

Future Demands of Your Water Works, by Blucher A. Poole, Director, Bureau of Environmental Sanitation, Indiana State Board of Health, Indianapolis.

Mr. Poole stated that the Indiana Water Resources Study Committee published a report in 1956 which recorded the state's water resources problems and forecast its needs in 1975. However, some data accumulated since 1954 indicates some of the forecasts may need altering.

Water consumers of the future will demand a higher grade water. In fact, we will find that in 1975 drinking water will be: Practically free of turbidity and color; More palatable; Contain Fewer bacteria, and Contain less objectionable chemicals, such as iron and hardness-producing compounds. Revisions to the 1946 Drinking Water Standards of the Public Health Service are being studied. It would not be surprising if the new standards were brought up to the World Health Organization International Standards for Drinking Water. For example International Standards have allowance standard of 0.01 on cyanide and 75.0 on calcium where there are no standard limitations in the PHS on these items. Generally all properties found in water are at a lower allowable standard by Internation requirements than those in the PHS standards. PHS allows 10 and 20 parts in water and International allows only 5 each for turbidity and color.

The major quality problems of the next decade will die in the areas of taste and odor control. This points up that a higher degree of sewage treatment is required. Further quality problems will probably be created by detergents, minute quantities of new chemicals, radioacitvity, and possibly viruses. It is also estimated that the average per capita consumption in the larger cities will be between 165 and 170 gpd.

Fire Protection, by George Stahl, Asst. Chief Engineer, National Board of Fire Underwriters, Chicago, Ill.

Mr. Stahl explained in detail the various problems encountered by water departments in obtaining a top rating by the Fire Underwriters. He discussed the 5000 deficiency point system used by the Board.

In the discussion following the presentation of the paper, in response to a question from the floor, Stahl stated that after a survey by the Board, if a water works makes the corrections noted in the survey, it can call upon the board for a new survey to raise that communities rating.

He further pointed out that communities should place a minimum of one hydrant every 500 ft, or one at each intersection plus one in the middle of long blocks in new suburban developments. Another point often overlooked in the building of new suburban communities and shopping centers was the need for as many hydrant outlets in a shopping center as are normally required in a business section downtown. This point is many times ignored or just forgotten.

Management and Adequate Rates, by Wendell R. LaDue, Chief Engineer, Bureau of Water Supply Akron, Ohio.

Mr. LaDue stated that he felt his paper ought to be titled "The Privileges of Water Utility Management.

He pointed out that management of a water utility covers everything from Public Relations to Legislation to Radio use.

Water utility management calls for specialized experiences in a service most necessary to human existance and everything involved in the production and delivery of a product for which there is no known substitute.

Good management is just as vital and essential to a small utility as to a large one. The managers are involved in exactly the same problems.

Today this service is supplied by one employee for every 1,250 people served, or 110,000 water utility workers serving 135,000,000 customers.

The objective of a successful administration is good management. Good management is the result of a combination of continuing policies with respect to expansion of both facilities and operations, sound financing, trained personnel, efficient conduct of business, and satisfying services.

Good management also engenders and commands employee confidence.

A good waterworks manager recognizes the responsibilities and virtues of his position; does not overrate his official authority; delegates this authority with proper backing; values his community influence and prestige; and accepts true and evident responsibility as being his accountability to his public and his employees.

Automation and Automatic Pump Controls, by Charles S. Harris, Midwest Sales Mgr., Hammarlund Mfg. Co., Arlington Heights, Ill.

Automation is not large cabinets of complicated electronic equipment requiring highly skilled engineers to operate and maintain. The simplest application is the use of a float switch to operate a booster pump.

Automation equipment should provide economic or operational advantages, or else it is of no value to the plant or the community.

As a system expands it looks to the manufacturers for a means of adapting automation to its existing equipment or additional equipment to meet its new requirements. As the system expands and installations become separated, multiplexing may provide the answer—whereby a single voice grade circuit can be used to carry simultaneously many separate and distinct functions.

An electronic system must be easily expanded without making present equipment obsolete, and must be compatable with any transmission medium.

Application Examples, by Ray C. Haller, Engineer, L. I. Couch Co., Inc., Consulting Engineers, Indianapolis.

In describing the installation in small water systems—City of Aurora, and town of Dillsboro in Dearborn County.

The installation included an alarm system and also permits the following operations. If the level on the tank drops 3 ft below overflow the pump starts. The pump stops when level reaches one foot below overflow. If the pump fails to stop, the high level alarm sounds when the level is 6 in. below overflow. If water falls 2 ft below "Pump on" level, the low level alarm will sound.

The system is composed of 3 parts —A transmitting unit in Town Hall next to the elevated tank, a receiver to start pumps is located in the booster station, and a float level.

Automatic Control Systems and Maintenance, by Walter Huff, Electrical Contractor and Controls Specialist, Indianapolis.

Mr. Huff pointed out some things to do and not to do in servicing and maintaining different types of control systems.

1. Tanktrol—A very sensitive instrument that allows levels and pressures to be controlled within inches. This assures economical pump operation. However, a time delay relay should be included in all tanktrols, in both the stopping and starting circuits to permit response to true tank pressures only.

2. Closed System Controls—The motortrol provides a means of matching the pumping speed of pumps to the demand on the system. This provides for a minimum use of horsepower to match the demand at any given time.

3. Bubbler Systems—These systems are used principally for control of pumps in sewage system applications. However they are particularily applicable to water systems where large amounts of iron or minerals are present in the well water. Installation is easy, low in cost and needs practically no maintainance.

4. Multi-step—Telemetering in one direction only. This is used primarily for alarm of operational signals.

5. Proportional Range Sensor—This is used to send operational alarm and proportional signals. A two-stage "balance Amplifier" can cause a motor to drive a camshaft, either in the forward or reverse direction as water level in tank varies. It can send signals in one direction only.

6. Telescan System—Capable of sending many signals in either direction over many miles on one pair of wires. Signals will initiate operation, report success or failure of operation; provide emergency alarms; indicate or record such measurements as pressure, level, flow, and other quantities. This is a true bi-directional supervisory control system.

In regard to maintenance Mr. Huff stated that a new control system should always be set up and calibrated by a qualified man.

Chlorine is always the greatest danger present to control equipment —A point to remember is "if you smell chlorine in the control equipment, it is probably too late to clean it up". Plant design should include a separate completely isolated chlorine room.

Moisture and dirt are the chief trouble makers for control equipment.

Turn off power supply before touching live parts.

Contact points should be cleaned only with a burnishing tool—never use sandpaper or emery cloth.

In pressure sensitive devices, be sure to bleed out pressure line once a month—and remember to turn off the pump first.

Never take a tap from a pressure sensing line.

Never touch a telemetering line until you have checked it with a high scale Voltmeter for both AC and DC.

PRESIDENT Tom Moses and executive vice president Don Morse with presentation and AWWA Adancement Award won by the Indianapolis Water Co.

Operation efficiency can be predicted using an equation derived from basic . . . .

Trickling Filter Theory

by K. L. SCHULZE, D.Sc., Dept. of Civil Engr., Mich. State Univ., East Lansing, Mich.

EDITOR'S NOTE: Hydraulic load and depth of filter are two of the major factors which determine efficiency in trickling filter operation. BOD removal is related to hydraulic loading, which is related to the depth of the filter, and the combination of the two predict contact time. This group of variables is expressed mathematically by the author and justification for the equation is supported by experimental data. Two factors not considered are temperature and recirculation.

■ TRICKLING FILTERS represent one of the most widely used devices for industrial wastes treatment even though there exists up to date no comprehensive theory which would guide the design of these installations. So far designing is regulated by empirical standards which often have to be modified in order to accommodate industrial conditions. Nevertheless a number of basic facts are known which are suitable for the formation of a theoretical framework.

The purpose of the filter bed is to provide a support for the biological film that develops when waste is applied. Purification of the waste is accomplished by the biochemical activity of this film. Assuming stone of uniform spherical shape in tight packing, calculation shows that about 52 percent of a given filter volume is taken up by the carrier material or media. This leaves about 48 percent of the filter volume for free space between the individual pieces of gravel or stone. These voids between the stones are the most important part of the filter, they provide the space for the development of the biological growth and for the passage of waste liquid and air. In practice less than 48 percent voids is usual, because the stone is not uniform and spherical.

The name *filter* is actually not correct. The polluting material is not removed by the filtering action of fine pores; if it were, the plant would soon be clogged. A trickling filter operates more like an absorption tower or like a large sponge containing thousands of cavities lined with a moist film of microorganisms. Waste liquid flows over this biological growth as a thin sheet forming a large contact surface of air and water. All the cavities are interconnected by a maze of irregular channels, permitting air to move through the system. The process is schematically represented in Figure 1.

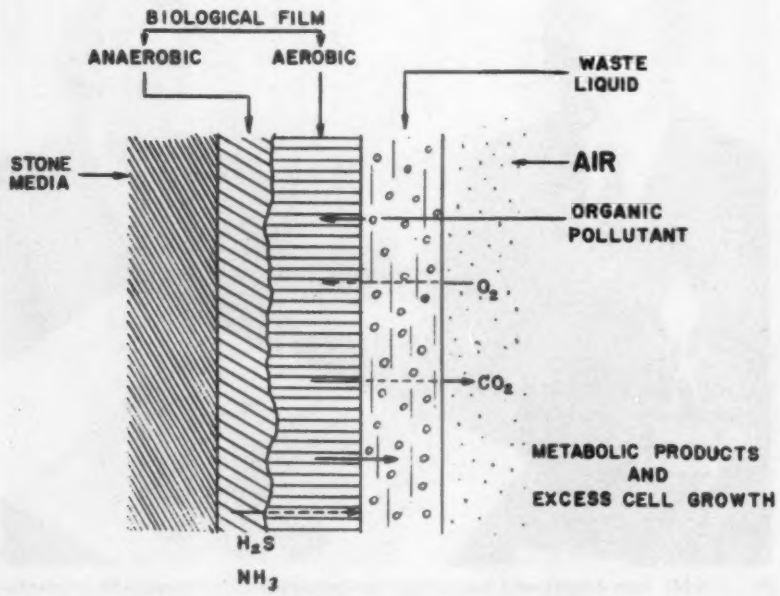


FIG. 1. SCHEMATIC DIAGRAM of Trickling Filter Process.

Biological Film

The diagram shows the biological growth coating the stone surface, the waste liquid film, and the air in contact with the liquid film. The masses of bacteria contained in the biological film adsorb particles of organic waste material that are passing by in the stream of waste liquid. The adsorbed organic substances such as carbohydrates, fats, and proteins are then

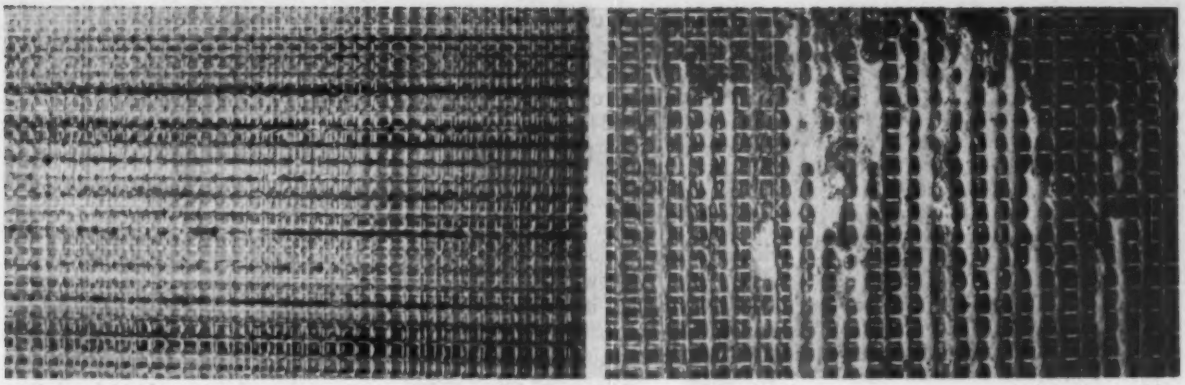


FIG. 2. SCREEN GROWTH, at left, after receiving settled sewage for 13 days. Same screen on right after addition of whey which represented a 2000 mg/L BOD increase.

enzymatically split into smaller units and oxidized or used for the growth of new bacterial cells. The amount of organic pollutant adsorbed and oxidized or converted to new cell growth is measured in pounds of BOD removed per unit filter volume, or as percent BOD removal or percent efficiency.

For the oxidation process carried on by the bacteria a continuous supply of oxygen is necessary. Bacterial cells do not use atmospheric oxygen directly but require instead dissolved oxygen. The solubility of oxygen in water is very limited, at 70°F a maximum of about 8 mg/L oxygen can be dissolved. Since there is no appreciable storage, the dissolved oxygen has to be constantly renewed by contact with the atmosphere. The channels between the cavities in the filter must therefore be open so air can move through the system.

The limited supply of oxygen also leads to another conclusion. Deeper layers of the zoogleal growth cannot get all the oxygen they need. The exchange of oxygen-carrying water is slow in these regions and the diffusion of dissolved oxygen to these layers is also slow. Therefore a zone of lack of oxygen develops in the deeper layers of the biological film, as shown in Figure 1 under the designation "anaerobic layer." This layer is usually black in color and is more pronounced when the aerobic layer on top of it is more than ⅛ inch thick. The aerobic layer usually has a brown or grey color. The metabolic products of the aerobic layer are those expected from an oxidation process, primarily carbon dioxide and water. In addition, most of the metabolic products of the anaerobic layer, such as hydrogen sulfide (H_2S), acids, and ammonia, are oxidized in the aerobic layer. Not all of the organic material contained in the waste is completely oxidized, part of it is converted into new growth which tends to increase the thickness of the biological film.

Normally the excess growth sloughs off and is carried out by the filter effluent into the final settling tank. A portion of this filter sludge, however, is always retained in the filter, especially in the narrow passageways and corners not reached by the liquid scouring action. If this sludge accumulates to such an extent that it clogs all passages in a certain filter area, we have the condition known as "ponding". The ponded part of the filter cannot produce any aerobic treatment as it is shut off from the oxygen supply. The overall result is a reduction in efficiency of the filter in proportion to the extent of ponding.

Affect of Loading

There is another aspect connected with the ponding problem. In research done since 1956 at Michigan State University[1] it was observed that the thickness of the aerobic layer was directly related to the strength of waste treated on the filter. The treatment of municipal sewage never produced more than ⅛ inch of biological growth on the experimental filter. But as soon as the BOD of the sewage was increased to 500, 1000, or 200 mg/L by adding whey, the thickness of the biological film increased up to ½ inch as shown in Figure 2. On the left is a photograph of the screen receiving East Lansing sewage. It shows a thin brown coating on the strands of the screen. The photograph on the right is the same screen when whey was added and the BOD increased to 2000 mg/L. The difference demonstrates clearly the heavy growth developed under high BOD conditions. On a conventional filter the same growth would occur if undiluted dairy wastes were treated. The heavy film would clog the narrow and irregular passageways within the filter media, and the whole filter would pond in a short time. This is one reason why strong industrial wastes require a high recirculation rate. The intention is to dilute incoming raw wastes by a high proportion of recirculated flow, so the BOD of the mixture distributed over the filter does not exceed a value of approximately 800 mg/L. In addition the increased hydraulic rate helps to flush the filter and keep the passage free.

These considerations now lead to the more physical aspects of trickling filter theory. It was mentioned earlier that the removal of BOD through the filter depends on the activity of the biological film. One deduction from this fact would be that the more time the waste is allowed to be in contact with the biological film the higher would be the degree of treatment achieved.

Here it should be understood that there are always two kinds of loads being placed on a filter: the organic load, and the hydraulic load. Organic load is measured in pounds of BOD per unit filter volume per day. The various equal units of expression are given below for comparison:

1 lb. BOD/cubic yard/day
1613 lb. BOD/acre foot/day
37 lb. BOD/1000 cubic feet/day

The unit recommended by the FSI-

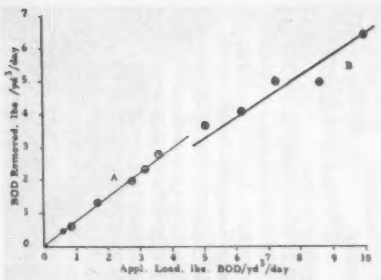


FIG. 3. RELATIONSHIP between organic load and efficiency
A = series I, hydraulic load 5.5 mgad.
B = series II, hydraulic load 8.1 mgad.

WA Subcommittee on Standardization of Units is pounds of BOD per 1000 cubic feet per day. For low rate or standard filters the organic load ranges normally from 5 to 25 lb BOD/1000 cu ft/day. With high rate filters employing recirculation, organic loads from 25 to 300 lb BOD/1000 cu ft/day are used.

Hydraulic load has usually been measured as millions of gallons per acre of filter surface per day. Sometimes gallons per square foot per day is used. The unit recommended by the Subcommittee on Standardization is feet per day, equivalent to cubic feet of liquid per square foot of filter surface per day. Hydraulic load is thus measured in depth of liquid applied to the filter surface, much in the same manner as rainfall. A comparison of the various equal hydraulic units is given below:

1 mil. gal. per acre per day (mgad)
23 gal. per square foot per day
3.061 feet per day

Low rate or standard filters are operated at 5 to 15 feet per day or 1.65 to 4.9 mgad. For high rate filters the range is from 15 to 100 feet per day or from 4.9 to 33 mgad. These hydraulic loads include recirculation flow.

Varied Organic Loads

Returning to the theory that degree of treatment depends on the time the waste is in contact with the biological film, it is important to consider the effect of the two kinds of loads on contact time or detention time in the filter. Organic load as such apparently is not related to contact time and therefore not to the efficiency. The reason is that organic load can be changed without any change in hydraulic load. Let us assume a given filter is operated at a hydraulic load of 4 mgad and the incoming waste flow is 1 mil. gal. per day at an average strength of 100 mg/L BOD. The total BOD load on this filter would then be $10^6 \times 8.34 \times 100/10^6 = 834$ pounds of BOD per day. If under the same conditions the average BOD of the incoming waste were increased to 200 mg/L, the BOD load would double to 1668 pounds of BOD per day. Since the flow through the plant was not changed it would be reasonable to assume that in both cases the waste had the same opportunity for treatment. The expected result would be that the efficiency or percent BOD removal should be the same in both cases.

Figure 3 shows a series of data which were obtained from an experimental trickling filter at Michigan

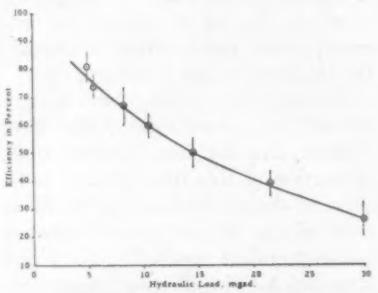


FIG. 4. RELATIONSHIP between hydraulic load and efficiency

State University[2]. In Series I the filter was operated at a constant hydraulic load of 5.5 mgad and the average BOD removal, determined from the slope of the line, was 74.4 per cent. Increasing the organic load from 1 to 4 pounds of BOD per cubic yard per day did not change the efficiency, as can be seen from the straight line relationship between pounds of BOD applied and pounds of BOD removed. The same was true for Series II, where the organic load was increased from 5 to 10 pounds of BOD per cubic yard per day at a constant hydraulic load of 8.1 mgad. Here the average efficiency was 65.5 percent. Series I and II together cover a range in organic load from 0.5 to 10 pounds of BOD per cubic yard per day, or from 17 to 370 pounds of BOD per 1000 cubic feet per day. In both series it was demonstrated that efficiency was independent of organic load, as long as the hydraulic load remained constant.

Varied Hydraulic Loads

The picture changes though if the effect of hydraulic load is considered. Doubling the hydraulic load or the flow to a given filter certainly would affect the contact time. As a first approximation one might assume that the contact time and therefore the efficiency, would be reduced to one half its previous value. Certainly actual conditions will not be as simple as that. In practical operation trickling filters seldom receive a constant hydraulic load, and most filters employ a certain amount of recirculation. Information on the effect of hydraulic load would have to come from experimental filters, where all other factors are kept as nearly constant as possible.

In Figure 4 a series of data is shown from the experimental trickling filter at Michigan State University where hydraulic load was increased from 5 to 30 mil. gal. per acre per day. The curve demonstrates that efficiency measured as percent BOD removal decreased regularly with increasing hydraulic load. The curve also shows that the relationship between efficiency and hydraulic load is not as simple as the one mentioned previously.

Mathematical Formulations

It was found that a plot of the logarithm of percent BOD remaining against the logarithm of hydraulic load resulted in a nearly straight line, as shown in Figure 5. With the exception of one point, the experimental data fitted this line quite well. The curve can be represented by the parabolic equation.

$$L_e/L_i = aQ^c \quad \ldots\ldots\ldots (1)$$

where L_e = final effluent BOD, mg/L
L_i = incoming waste BOD, mg/L
Q = hydraulic load, mgad
c = a constant
a = intercept at $Q = 1$

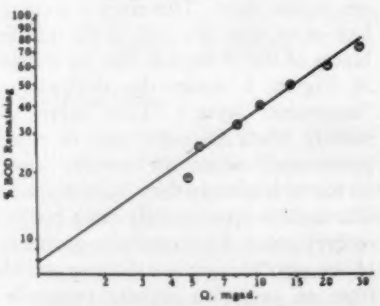


FIG. 5. PERCENT BOD remaining versus hydraulic load, (Data from Screen Filter)

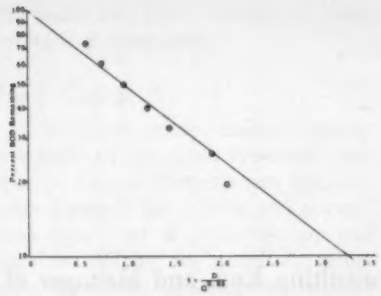


FIG. 6. PERCENT BOD remaining versus time factor $t = \frac{D}{0.66}$ (Data from Screen Filter)

The constant derived from the graph was $c = 0.67$ and the intercept was $a = 0.079$, so the equation of the experimental curve becomes

$$L_e/L_i = 0.079\ Q^{0.67} \quad \ldots\ldots (1a)$$

The fraction of BOD remaining is thus proportional to the hydraulic load to the 0.67 power. The value of the constant **c** agrees with the two-thirds power of **Q** introduced recently by Howland[3] and by Bloodgood, Teletzke, and Pohland[4] in computing the contact time for trickling filter models. According to Howland, contact time is directly proportional to depth of filter and inversely proportional to the two-thirds power of the hydraulic load:

$$t = D/Q^{0.67} \quad \ldots\ldots (2)$$

where t = a factor representing contact time,

D = depth of filter in feet.

If it is assumed that the degree of BOD removal is directly related to contact time, the time it takes the waste to pass through the filter, then this could be expressed by the equation:

$$L_e/L_i = e^{-kt} \quad \ldots\ldots (3)$$

where t would be replaced according to equation (2), and:

$$L_e/L_i = e^{-kD/Q^{0.67}} \quad \ldots\ldots (4)$$

or

$$L_e/L_i = 10^{-kD/Q^{0.67}} \quad \ldots\ldots (5)$$

where K = constant, $k = 2.303\ K$.

A plot of $\log L_e/L_i$, the fraction or percentage of BOD remaining, against the time factor **t** should then result in a straight line with slope **K**. The experimental data previously shown in Figure 4 were used to test the value of these mathematical formulations. The results are presented in Figure 6.

This graph demonstrates that the experimental data fit the equation reasonably well. For contact time zero, at an infinitely high hydraulic load, 100 percent of the BOD remains. With increasing contact time or decreasing hydraulic load, the percent BOD remaining decreases in direct proportion. In other words, the efficiency improves in direct relationship to the diminishing hydraulic load. The experimental **K** values varied between 0.22 and 0.33. From the slope of the line in Figure 4, a **K** value of 0.3 was determined.

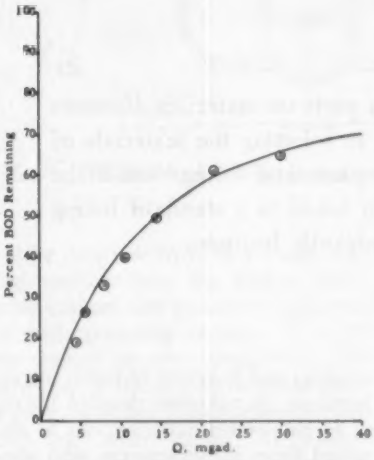


FIG. 7. EFFECT of hydraulic load on per cent BOD remaining for K = 0.3

Using this **K** value in Equation 5, the efficiency of a trickling filter can be predicted for any combination of depth and hydraulic load. Two examples are given in Figures 7 and 8. Figure 7 shows the effect of hydraulic load on a six-foot filter, and it can be seen that the experimental data from the screen filter fit the curve very well. In Figure 8 the theoretical efficiency curve for various depths at a hydraulic load of 5 mgad has been plotted. For comparison, experimental data were taken from the work of Grantham, Phelps, Calaway, and Emerson[5]. As can be seen, the points follow the curve to a reasonable degree. These results clearly demonstrate that hydraulic load and depth are two of the major factors determining the efficiency of trickling filters. Organic load, which has been used extensively as a parameter, does not affect efficiency as long as the organic load remains below a certain critical level. As shown by the curves in Figure 3, the critical level has not been reached at a load of 10 pounds of BOD per cubic feet per day, corresponding to 370 pounds BOD per 1000 cubic feet per day. The great majority of trickling filters are operating below this level.

In addition to hydraulic load and depth there are two other factors which should be considered in any trickling filter theory, namely temperature and recirculation. It appears however that considerably more experimental work is needed in these areas of research before any theoretical approaches could be supported by data. Nevertheless, Equation 5 provides a basis for computing the efficiencies of single-pass filters at any given combination of hydraulic load and depth.

References

1. Schulze, K. L., "Experimental Vertical Screen Trickling Filter," *Sewage and Industrial Wastes* 29, 4, 458 (April 1957).
2. Schulze, K. L., "Load and Efficiency of Trickling Filters," presented at 32nd annual meeting, Federation of Sewage and Industrial Wastes, Dallas, Texas, Oct. 1959, to be published in *Sewage and Industrial Wastes.*
3. Howland, W. E., "Flow over Porous Media as in a Trickling Filter," Proc. 12th Industrial Wastes Conference, Purdue University, May 1957, p. 435.
4. Bloodgood, D. E., Teletzke, G. H. and Pohland, F. G., "Fundamental Hydraulic Principles of Trickling Filters," *Sewage and Industrial Wastes,* 31, 3, 243 (March 1959).
5. Grantham, G. R., Phelps, E. B., Calaway, W. T. and Emerson, D. L., "Progress Report on Trickling Filter Studies," *Sewage and Industrial Wastes,* 22, 7, 867 (July 1950).

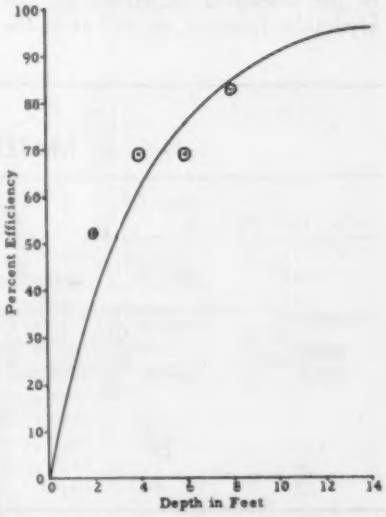


FIG. 8. EFFECT of filter depth at hydraulic load 5 mgad, K = 0.3, (Data from Granthan et al, 1950)

Part 19 of this series on centrifugal pumps deals with . . .

Pump Materials — *Part I*

by IGOR J. KARASSIK, Consulting Eng. and Manager of Planning, Harrison Div., Worthington Corp., Harrison, N. J.

EDITOR'S NOTE: This first of two parts on materials discusses the factors that must be considered in selecting the materials of which centrifugal pumps and their parts and fittings are to be made. These considerations are then keyed to a standard listing of parts already proposed to the Hydraulic Institute.

■ CENTRIFUGAL PUMPS can be manufactured of almost all the known common metals or metal alloys, as well as of porcelain, glass, and even synthetics. But it is beyond the scope of this article to present a listing of all the liquids which may be encountered in centrifugal pump applications with a corresponding tabulation of the materials commonly recommended for each of these liquids, as such a listing can be found readily in the standards published by the Hydraulic Institute, as well as in the catalogs and bulletins of pump manufacturers. A complete detailed listing of recommended materials can be obtained from manufacturers who specialize in centrifugal pumping equipment for various chemical services. It is in this latter application that one can find the greatest variety of special problems. Therefore, the current discussion is limited to certain general considerations in the selection of materials used for the various parts of a centrifugal pump.

Of course, the conditions of service and the nature of the liquid to be handled determine the most satisfactory materials for the construction of centrifugal pumps. Some of the factors which enter into the selection of the materials are:

1. Corrosion resistance.
2. Electrochemical action.
3. Abrasiveness of any suspended solids.
4. Pumping temperature.
5. Head per stage (as it affects both the impeller peripheral velocity and the liquid velocities in the waterways).
6. Operating pressure.
7. Suitability of the material to the structural features of the particular pump involved.
8. Load factor and expected duration of the pumping installation.

The first analysis concerns itself with the separate parts which comprise a centrifugal pump and with

Table I

MATERIALS USED[a] IN CENTRIFUGAL PUMPS

Part No.[b]	Name	Standard-Fitted Pump	All-Iron Pump	All-Bronze Pump
1	Casing	Cast iron	Cast Iron	Bronze
35	Suction Head	Cast iron	Cast iron	Bronze
4	Impeller	Bronze	Cast iron	Bronze
12	Impeller ring	Bronze	Cast iron or steel	Bronze
3	Casing ring	Bronze	Cast iron	Bronze
	Diffuser	Cast iron or bronze	Cast iron	Bronze
5	Stage Piece	Cast iron or bronze	Cast iron	Bronze
2	Shaft (if sleeve used)	Steel	Steel	Steel, bronze or monel
2-A	Shaft (if no sleeve used)	Stainless steel or steel	Stainless steel or steel	Bronze or monel
10	Shaft sleeve	Bronze	Steel or stainless steel	Bronze
15	Gland	Bronze	Cast iron	Bronze

[a] Materials for bearing housings, bearings and other parts are not generally affected by the liquid handled.

[b] Parts in this table and in Figs. 1 through 4 are numbered according to a proposed standard listing suggested to the Hydraulic Institute by C. J. Tullo, Chief Engineer, Worthington Corp. This proposed standard gives stationary parts odd numbers and rotating parts even numbers.

the materials most commonly used for each of these parts.

Pump Casings

Centrifugal pump casings usually are made of cast iron. However, cast iron at normal temperatures has definite strength limitations and a cast-iron casing of a given design will only be suitable for a definite pressure limit. If higher pressures are encountered (either through operation at higher than design speeds or through the existence of high suction pressures), the design must be modified to obtain greater strength or a metal which can be stressed to a higher value (such as cast steel) must be substituted for the cast iron.

Occasionally, pumping systems are subjected to water hammer or shock pressures far in excess of the normal operating pressures and a stronger metal than cast iron is necessary.

Although theoretically it might be possible in some cases to use a cast-iron casing under high pressure, the required thickness of metal would not be satisfactory from the point of view of foundry practice. Sometimes the substitution of thinner cast steel sections for heavy cast-iron casings may compensate the higher material cost, almost to the point where use of cast steel is the more economical solution. Whereas each centrifugal pump design has its own pressure and temperature limitations, there is an upper limit where practical and economic reasons dictate the use of the cast steel regardless of pump design. Thus, cast-iron casings are seldom used for pressures greater than 1,000 psi and temperatures greater than 350 F.

Insofar as temperatures are concerned, it must be considered that the repeated heating-up and cooling-off of a pump handling a hot liquid will aggravate any minute imperfections in either iron or steel castings. There is no absolute certainty that a casing, which was originally tight, will remain tight after the unit has been in service for an extended period. If a leak does develop in a cast-steel casing, it can be corrected by welding. The same process may be impractical in the case of a cast-iron casing.

It must also be considered that piping for use under high temperature and high pressure conditions is generally made of steel. As it would not be desirable to have a pump casing weaker than the piping itself, steel casings are generally preferred in such pumping systems. Even in the matter of pipe connections, the selection of the casing material plays a part; it is not recommended to use cast iron when raised face flanges are used on the connecting piping.

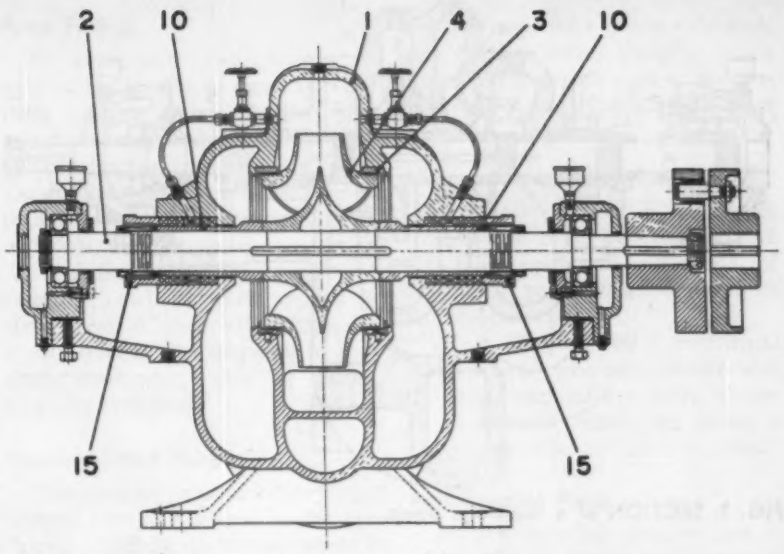


FIG. 1. SECTION of a double-suction, single-stage pump with shaft sleeves.

Cast iron loses in tensile strength and becomes quite brittle at low temperatures. For this reason, casings of pumps handling liquids at very low temperature (such as brine) are generally made of alloyed cast iron or cast steel.

Bronze is frequently used for pump casings when the liquid pumped is mildly corrosive (for instance, sea or harbor water). Stainless-steel casings are used when the pumped liquid is corrosive or excessively abrasive. Porcelain or glass casings are sometimes used for very special applications.

Impellers

Bronze impellers are generally preferred for handling average waters because bronze is easier to cast when complicated core sections are involved, it is easier to machine, smoother surfaces can be obtained, and, finally, because bronze does not rust. However, it is not desirable to use bronze impellers with cast-iron

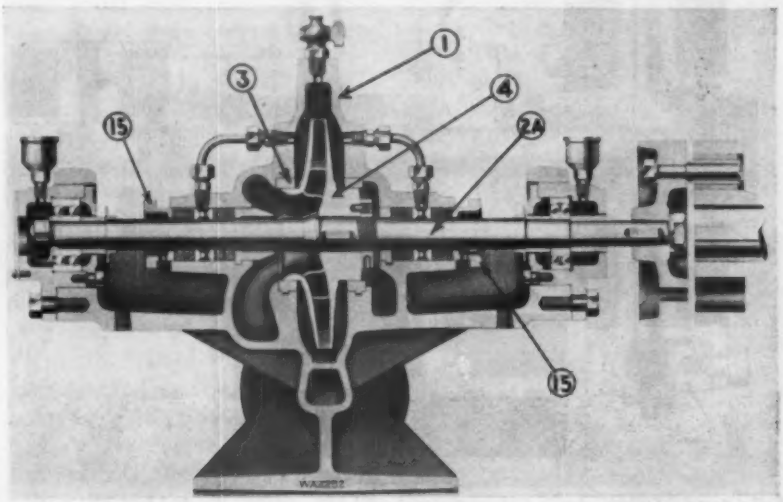


FIG. 2. SECTION of a single-suction, single-stage pump without shaft sleeves.

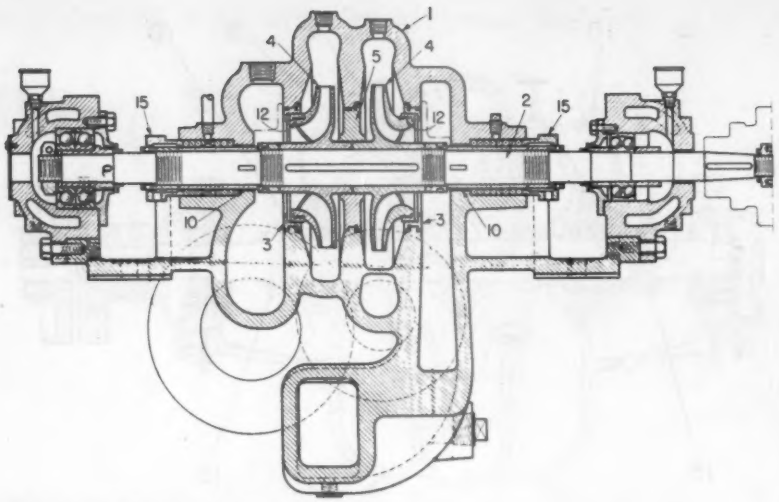


FIG. 3. SECTION of a two-stage pump.

casings if the liquid handled is a strong electrolyte. In such cases, all ferrous materials should be used.

When heated, bronze expands approximately 40 percent more than steel. Because pumps are assembled at normal room temperatures, the original radial clearance between the hub of a bronze impeller and a steel shaft may increase appreciably under operating conditions if the pumping temperature is above normal. This increased clearance can loosen the impeller on the shaft, leading to leakage and erosion.

In addition, it must be remembered that the impeller assembly must be held axially by means of shaft nuts or shaft sleeves, which themselves are fixed on the shaft by means of external nuts. If the axial assembly is made tight under cold conditions, the unequal expansion of the impeller hub and the shaft will cause "crushing" of the bronze impeller hub and may set up severe stresses in the shaft itself. If the assembly is made so as to be tight under operating temperature conditions, the impeller will be loose at low temperatures and there is no possible means to hold it in accurate axial alignment until the pump becomes heated.

Finally, if there are changes in the operating temperature, it would be impossible to keep the assembly tight at all temperatures without setting up excessive stresses. These possibilities are removed when the pump fittings are such that the expansion of the shaft, impellers, and sleeves is equal. For these reasons, bronze is generally not used for pump fittings whenever the temperature of the pumped liquid exceeds 250 F.

There are also limitations placed on the use of bronze impellers by the effect of peripheral speeds. The centrifugal stress exerted on an impeller and the resulting stretch at the impeller hub may become quite appreciable at the higher peripheral speeds used in modern high-head pumps. As an example, a typical 12 in. impeller mounted on a 3 in. shaft and operating at 3,600 rpm will have a stretch of approximately 0.0011 in. for bronze and cast iron. If, in addition to this, the pump handles hot water—say at 250 F—and the impeller is made of bronze, there will be an additional temperature expansion difference of 0.0014 in. resulting in a total looseness of 0.0025 in. between the shaft and the impeller, which would be excessive.

Thus, to avoid the cumulative effect of excessive thermal and centrifugal expansion, the empirical limit to the use of bronze impellers in pumps handling hot liquids is a peripheral speed of approximately 160 ft per sec, or a head of 375 ft per stage.

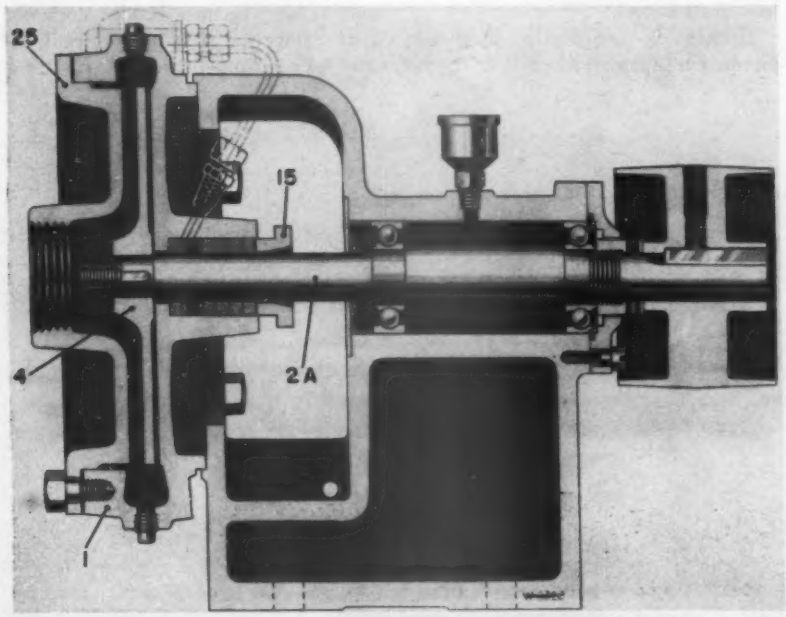


FIG. 4. SECTION of an end-suction, single-stage pump for light duty service.

Wearing Rings, Shafts, Sleeves, etc.

Wearing rings are usually made of bronze for the same reasons as the impellers. However, cast-iron, cast-steel, stainless-steel or monel rings are sometimes used, regardless of whether the impeller itself is made of bronze or of another metal. Such metals are used when hardness or other properties unobtainable with bronze are required.

When shaft sleeves are used the shaft is generally made of open-hearth steel. If high stresses are to be encountered, preference may be given to high tensile strength alloy steels. When corrosive liquids are handled, some seepage may occur either through the pores of the impeller hub or through the joint between the impeller and the sleeves. This is avoided by the use of non-corrosive metals such as stainless steel, phosphor

bronze, or monel metal. If the pump has no shaft sleeves, the shaft is generally made of stainless steel, phosphor bronze, or monel metals, depending on the liquid to be handled.

A shaft sleeve which protects a shaft in a stuffing box must be made of a material that can be given a smooth finish so that it will operate properly in conjunction with the packing. This is why cast iron is rarely used for shaft sleeves, the majority of them being made of bronze. In applications where bronze sleeves are not satisfactory because of their relative low degree of resistance to abrasion, stainless steel is used. Although a few years ago steel sleeves were more prevalent than stainless steel, the growing popularity and reduced cost of the stainless alloys has caused stainless steel to supersede ordinary steel and, in some services such as boiler feed, even bronze as shaft sleeve material.

Glands are generally made of bronze, although cast iron or steel may be used for all-iron fitted pumps. Where pumps are handling hydrocarbons, iron or steel glands are bushed with bronze to avoid possible sparking, which could ignite inflammable vapors.

Pump Fittings

The expression "pump fittings" is used rather loosely to mean two entirely separate things. In the most accepted sense, it refers to the general construction features of the pump (as for example, "ball-bearing fitted pumps") or to the combination of materials used in the pump, as in "all-iron fitted pump." In a different category (such as when applied in the expression "underwriter fittings") it may refer to various pieces of auxiliary equipment, such as valves, gages, or even tools.

Standard-Fitted Pump

The so-called "standard-fitted" centrifugal pump as defined by the Hydraulic Institute is bronze-fitted. It has a cast-iron casing, steel shaft, bronze impeller and wearing rings, and bronze shaft sleeves, when used. Some manufacturers regularly furnish stainless-steel shafts on pumps without shaft sleeves as standard-fitted pumps.

Various centrifugal pump manufacturers have developed specific material selections for pumps designed for special services. When a pump is so constructed it is generally termed as a "standard pump," although reference is sometimes erroneously made to "standard-fitted pump", even though the materials used do not correspond to the Hydraulic Institute definition.

All-Bronze and All-Iron Pumps

When all parts of a centrifugal pump which come into contact with the liquid pumped are made of bronze, the pump is considered to be an "all-bronze pump."

When all parts of a centrifugal pump which come into contact with the liquid pumped are made of iron or of ferrous metals, the pump is considered to be an "all-iron pump."

Acid-Resisting Pump

An acid-resisting pump is one in which all parts in direct contact with the liquid pumped are constructed of materials that will offer the maximum resistance to the corrosive action of the liquid.

[Note: The next—and last—article of this series will discuss certain specific applications and their effect on material selection, as well as the effect of structural features, of the load factor, and of metallurgical advances on the selection of pump materials.]

Wisconsin Court Reverses Water Ruling

A ruling recently handed down by the Wisconsin Supreme Court held that the State Public Service Commission lacked authority to issue water diversion permits without first obtaining consent of property owners downstream.

The issue was the first of its kind to reach the high state tribunal since the commission began issuing irrigation permits in 1950. The court's ruling is expected to govern commission policy until the Legislature enacts new water laws.

Justice E. Harold Hallows, writing the court's opinion, said: The commision contends it has the jurisdiction to determine whether the diversion of nonsurplus water will damage or injury riparian owners and if it finds no such injury the consent of such owner is not required. We find no authority in the statute for this position."

According to the statute, the court said, a beneficial user was damaged if nonsurplus water was diverted, and his consent was required. Consequently, if the commission determines that the flow of water is not surplus water because it is being used beneficially by riparian owners, it follows that diversion of such nonsurplus water would injure those beneficially using it and their consent must be obtained.

L. Matter Receives Appointment

Albright and Friel, Inc., Consulting Engineers of Philadelphia, Pa., have recently announced the appointment of Lawson D. (Deac) Matter as a member of their engineering staff. Mr. Matter will act as their Harrisburg, Pa., representative.

Formerly, he was the chief engineer, Water Supply Section, of the Pennsylvania Department of Health. Currently, he is a fellow of the American Society of Civil Engineers.

Instruction Manual for Water Plant Operators

The Bureau of Environmental Sanitation and the Office of Professional Education, of the New York State Department of Health, has published a 164-page book called the "Manual of Instruction for Water Treatment Plant Operators".

The Manual is distributed extensively by the Department of Health throughout New York where it is used as a text in the Grade II Water Treatment Plant Operators courses. In addition to the text, a number of diagrams are presented to augment the contents with graphic emphasis.

The book is now available through the Health Education Service for those residing outside the state at a nomical cost: Single sopies, $1.00 each; 25 or more copies, 75c each. Shipping charges in the United States are prepaid.

Agencies and individuals living in New York state should send their requests to the New York State Department.

21st Annual Conference of Ohio Section hears about . . .

Chemical Feeding & Water Stabilization

■ DURING THE RECENT 21st Annual Conference of the AWWA's Ohio Section, held in Dayton, Ohio, a number of interesting and highly informative papers were presented. In order that our readers may have some idea of the variety and scope of the topics discussed, a brief resume of these papers has been prepared.

MANUFACTURER'S FORUM COVERING CENTRIFUGAL, DEEP WELL AND IN-LINE PUMPS, was conducted by Mr. John Harmon of The Layne Ohio Co., Columbus, Ohio.

APPLICATIONS OF HORIZONTAL CENTRIFUGAL PUMPS were discussed by Mr. Howard Godfrey, Allis Chalmers, Mfg. Co., Milwaukee, Wisconsin. Tips on maintenance of packing, wearing rings, and impellers were provided, together with limitations restricting the use of these pumps in certain instances. It was pointed out that centrifugal pumps must be primed where end suction is not provided. Slides illustrated 8 unusual installations; location in a vertical position in dry well with side and bottoms suctions together with angle and vertical discharge connections were described.

VERTICAL TURBINE PUMPS were described by Mr. Edward Rudnicki, Layne and Bowler Corp., Memphis, Tenn. Vertical turbine pumps require minimum floor space, offer no side thrust, elimination of shaft alignment, a single stuffing box, a wide range of selection to meet changing conditions after installation, low initial cost and high sustained efficiency. Slides illustrated the bowl assembly, turbine and propeller designs, submersible pumps and motors. Importance of sump construction in vertical wells in order to prevent vortex formation and provide low velocity pump suction was emphasized.

CHEMICAL FEEDING: LIQUIDS AND SLURRIES was discussed by V. W. Langworthy, former chief project engineer with B. I. F. Ind., Inc., Providence, R. I. Fundamentals of feeding liquids and slurries with regard to applications in small and large municipal and industrial water treatment plants were discussed. Gravity and pressure feed systems were discussed together with types of equipment applicable to each feed requirement. Slides illustrated some common installation problems and how they can be solved. Design considerations, including chemical storage area, capacity of chemical storage space, adequate handling equipment (elevators, hoists, hand trucks, overhead monorails or pallets) and head conditions were emphasized. A table was presented listing 14 miscellaneous design considerations which should be helpful to engineers concerned with feed system design.

CINCINNATI METROPOLITAN WATER WORKS was discussed by Mr. William Sahnd, Supr. of Water Distribution, Cincinnati, Ohio. The history of Cincinnati's water supply includes the provision of water from streams in the hills, private well supplies (cash and carry), resulting eventually in inadequate service which led to the use of Ohio river water on a cash and carry basis. Formation of a water company in the early 1800's on a 99-year lease to provide fire protection did not provide constant service and was sold to the city in June of 1839 for 300,000 dollars.

The city sold a million dollars in bonds during 1900 and another million dollar's worth of bonds in 1901. These indebtednesses were paid off in 1939 and 1941 respectively. The water treatment plant financed by this method was placed in operation in 1904 and wholesaled water to 12 water districts.

The water system expansion has been planned and is now nearing 25% completion. It is expected that the program will be completed in 1962 and will have cost approximately 30 million dollars.

STABILIZATION VERSUS ENCRUSTED SAND, a discussion presented by Dr. A. P. Black, Dept. of Chemistry-University of Florida. The purposes of stabilizing water are to prevent encrustation and corrosion with possible tuberculation. The oldest means of stabilizing of water supply is through pH adjustment modified in 1939 by Lnagelier when he presented his paper on the pH of saturation. Demartini and Reznor experimented on water systems throughout the country also providing valuable information on the subject.

Threshold poly-phosphate treatment has been practiced successfully in many water systems, for example in Lansing, Michigan. There Mr. J. F. Dye feeds 0.2 parts per million of poly-phosphate for rapid sand filter and distribution system protection. It is believed that, through the feeding of poly-phosphate, an increase in the diameter of diffused layer of positive and negative charges is accomplished. The presence of poly-phosphate supplies sufficient excess of negative charges to control excessive precipation on sand or in water distribution mains. It is recommended that either pH control or poly-phosphate feed be used in water filter plants for protection against excessive encrustation or corrosion.

SPLIT TREATMENT OR CARBON DIOXIDE FOR RECARBONATION was analyzed by Mr. Paul D. Haney, Black and Vetch, Consulting Engineers, Kansas City, Mo. Whether to use carbon dioxide for recarbonation or to use a portion of the raw water

as a source of carbon dioxide is the question deserving of study by each plant operator to determine applicability to his system. It was suggested that each system has areas of applications when all factors have been considered. In the 36 mgd Springfield, Ohio water treatment plant lime soda softening is accomplished by mixing, flocculation and sedimentation (mechanical sludge removal). Second stage settling is followed by filtration.

Raw water is added to the second stage influent in order to remove the excess hydroxide alkalinity established in the primary treatment section. Split treatment such as this is possible if the character of the raw water permits. Turbidity, color, odor, hardness, and available carbon dioxide in the raw water are among the criteria which must be considered when split treatment is under study.

Extension Of Water Service, outside municipal or corporate limits, a panel discussion initiated by Mr. G. E. Cronk, Huber Homes, Dayton, Ohio. The Huber organization builds 500 to 800 homes per year, requires large land areas for this operation. The organization constructs its own water and sewage systems and sells water at a profit sufficient to sustain the water company. Developer's problem is to supply future needs and to obtain reimbursement for the capital outlay required. The surburban urge requires consideration of allocations for financing master plan costs. Where to get money, whether from bonds or other sources, must be arranged between the governing body and the builder.

Mr. P. D. Cook, Ohio Water Service Company, Mentor, Ohio pointed out that it was difficult to arrange a workable main extension policy. The water department considers the economic benefits derived from the sale of additional water. The political and emotional facts involved in a main extension policy should be carefully studied.

Mr. H. J. Crawford, attorney with Squire, Sanders, and Dempsey, Cleveland, Ohio pointed out that the basic municipal powers are granted in Ohio by the 1912 Home Rule Amendment to the Constitution. These include authority to own and operate a water department within corporate limits, to sell water in and outside the city and to sell mortgage revenue bonds. It is important to recognize the power comes from the Constitution, not the general assembly of Ohio. Utility properties are exempt from ad valorem taxation. The rates and differential rates for service are generally exempt from legislation interference.

Questions that have not yet been answered in Ohio are the extent to which the court can regulate utility operation, abandonment of service after once having initiated it, the extent a utility can go to get water outside of corporate limits and the relative rights of condemnation between two or more cities seeking water from the same supply.

Mr. D. T. Mitchell, the Jennings Lawrence Company, Columbus, Ohio points out that there are 3 ways suburban areas can get water. They can use existing statutes, establish a uniform contractual relationship satisfactory to all parties or become entirely annexed to another city (perhaps the least desireable).

Mr. L. G. Wolf, Summit County Engineer, Akron, Ohio suggests that sale of water to suburban areas is a hazard if the distribution system is not adequate to provide the increased load. Annexation is not the adequate answer to suburban utility services. Not an engineering problem, annexation resolves into political and financial problems. It is recommended that water be wholesaled rather than community. Fair price for water annexing a geographical area to a sale is 30% above cost.

Recent Advances in Equipment and Techniques of water analysis were included in a discussion by Stephen Megregian, Robert A. Taft, Sanitary Engineering Center, Cincinnati, Ohio. Included were water analysis instrumentation and techniques for fluoride, total hardness, boron, chloride and sulfate. Considerable emphasis was placed on importance of radioactivity determinations. Sources of radioactive isotopes from industrial and medical centers as well as power generating stations and mining and refining were described. Cost figures for radioactive analysis were provided in the discussion.

Organic chemicals in water deserve increasing attention by water works technicians so that they may be acquainted with means for detecting herbicides, insecticides and synthetic detergents potentially capable of contaminating water supplies. Encouragement for the use of the membrane filter in bacteriological analysis was given. This technique permits larger samples of water and requires less equipment, space and media.

Unless the water plant chemist experiments with new ideas and tries out new methods, he will not have the advance warning necessary to cope with problems which can arise as a result of an increase demand for water.

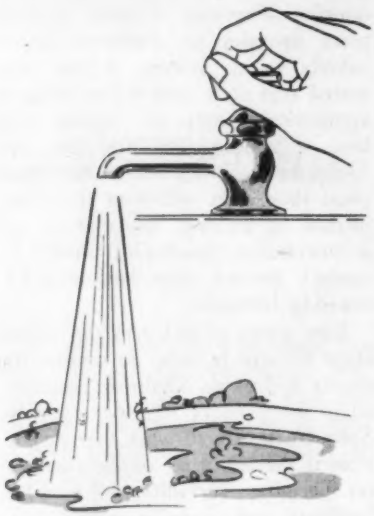
The Relining of Filtered Water Conduits Under Pressure was described by Mr. Roy M. Mumma, Division of Water, Cleveland, Ohio. After four years continuous service in the Division Street filter plant, 600 feet of 5½′ square conduit was inspected by divers. Discovery of cracks and honeycombing indicated that permanent repairs were necessary. Completed in January of 1957 the work involved sandblasting, installation of reinforcing mesh where necessary and the addition of heavy grout to place the conduits in operating condition. Slides illustrated condition of the conduits before repairs, placement of bleed connections, results of sandblasting, placement of mesh and views of the finished work.

Recalcining Water Softening Sludge at Dayton, Ohio was discussed by Mr. W. T. Eiffert, Dept. of Water, Dayton, Ohio. This plant, designed by Black and Associates, cost 1.5 million dollars and is expected to be written off in 7-10 years. Previously formed calcium carbonate sludge is carbonated, dewatered, and centrifuged to 65% solids and 35% water. The kiln rotates at 1 rpm and calcines the sludge at 2,000° farenheit.

Consideration of the recalcining plant derived from the exhaustion of local sludge disposal sites, as well as costs of lime delivered, CO_2 value, local fuel and power costs.

Use of flue gas CO_2 for recarbonation makes possible a 38,000 dollar per year savings. Sale of excess lime to nearby communities provides an outlet for 40 tons per day of the recalcined product. The product contains 91-92% CaO having ⅛th-¾" particle size. The lime has been found to slake satisfactorily in cold water. V.W.L.

PLENTY OF WATER makes the difference



And there's always plenty of water . . . when and where you need it . . . in Champaign-Urbana . . .

by EDWARD R. HEALY, Vice President & Manager, Northern Illinois Water Corp., Champaign, Ill.

EDITOR'S NOTE: The public is not aware of its need for good, safe, dependable water service—until it is without. This article tells of a company's efforts in public relations to demonstrate this need by comparing where they would be without water.

■ PUBLIC RELATIONS in the water works industry has long been a subject for concern. This was the case with the Northern Illinois Water Corp. who, like many others, only heard from the customer when he had a complaint.

The company has always maintained an active interest in public relations. In addition to conducting tours of the plant and facilities for University of Illinois and high school students, Chamber of Commerce community affairs and educators themselves, the company placed ads in two local newspapers. These ads were run for many years but received little or no public response.

Newspaper advertising was considered a good media for reaching the people, to keep them informed on what their water company was doing, intended to do or had done. Apparently something was wrong with the ads because no interest was generated by them.

Although the ads were seldomly professionally planned, each was directed toward some phase of the local operation or construction program. New facilities were pictured along with copy explaining possibly a new facility or some other phase of the water service operation such as pumping, treatment, etc. Attention was directed at the ever ready fire protection; the dependable water supply. Apparently the ads were too technical, too long and too detailed for the average newspaper reader to become interested in or take time to read.

The ads were run weekly in each of the two Sunday newspapers. This was a burdensome job in itself, but without public response, it became even more difficult. The ads were definitely informational in character and the ownership and management wanted to display its proud record of service to the community. Never was there one instance of water shortage which was not the case among neighboring communities. The company wanted the public to realize this and other facts but the ads just weren't reaching them.

At this time, which was a few years ago, an advertising agency was retained to give advice and assist in the preparation of ads. Unfortunately this was not the full solution because the agency could only reflect the ideas given it and these were not changed.

The management decided to evaluate the many ideas which it was trying to put across. An eye catching ad was desired; one that was attractive; could be recognized at a glance; would carry a definite message and could be presented as a series. Apparently one secret to modern advertising is to hammer home one message over and over again.

The Water Corp. personnel and the members of the Grubb-Peterson Advertising Agency joined in some "brain storming". The outcome was a phrase *Plenty of Water Makes the Difference*, which as a subject is easily adapted to news stories about water and water shortages. The message *and there's always plenty of water . . . when and where you need it . . . in Champaign-Urbana* makes the comparison and the story is told.

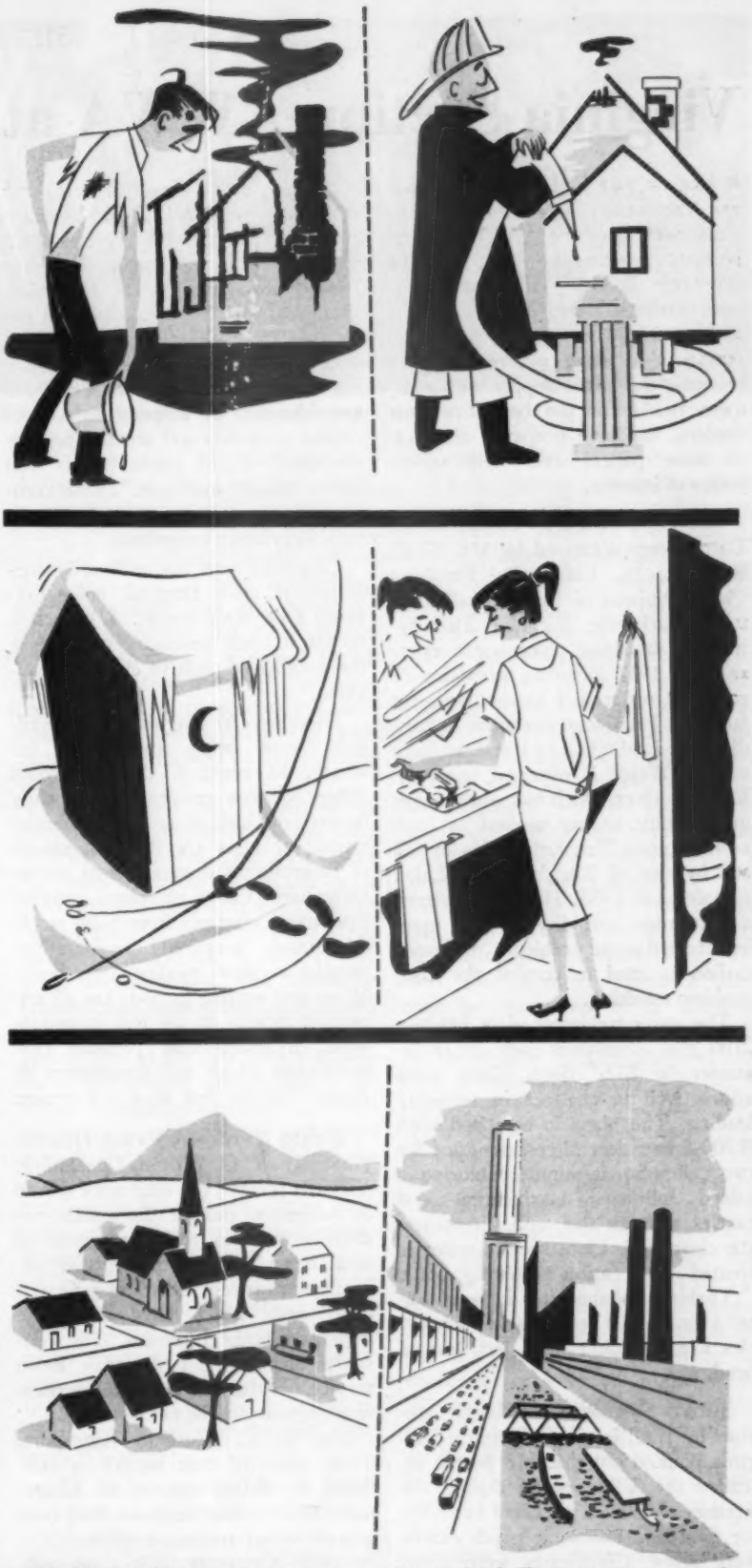
Comic strip illustrations are used to emphasize the difference plenty of water makes. These are patterned on the old before and after theme as can be noted by examples shown. The illustration is the only change in the series of ads, the message remains the same.

The ad series is planned for 26 ads. Each ad costs somewhere in the range of $75.00 when it finally gets into print. This is a rough estimate which includes agency fees for all advance planning, monthly planning, technical and production costs, plus newspaper space. The ads are not used on a mass volume basis, if so, the cost per ad would be even lower.

Because of budget considerations the ads are now run once every two weeks rather than the weekly schedule previously practiced. Also the day for running the ad has been changed from Sunday to Saturday in hopes of attracting more attention. Although the Sunday readership is larger, the chances of the ad becoming obscured among the voluminous advertising seemed more apparent than if placed in the smaller less crowded Saturday papers. It was felt that a larger number of the Saturday readers would notice and read the ad thus actually giving better coverage.

The response has been the best ever experienced. People say they look forward to the next ad to see what will come up as an illustration.

Our comments, of course, come from business, social or civic contacts because true public response is difficult to determine. As any water works man knows, it is seldom one hears from a pleased or satisfied customer since good service is taken for granted. Our educational accomplishments through public relations have not overcome this obstacle yet, but the company is happy to report that not one negative response has been received.



CARTOON TYPE illustrations are changed in each ad. These are some examples.
The Grubb-Peterson Advertising Agency, Champaign, Ill. is authorized to release these ads to any interested Water Utility.

Virginia Section AWWA at Roanoke, Va.

STAFF REPORT

■ ONE OF THE highlights of the Silver Anniversary Meeting of the Virginia Section of the A.W.W.A. held recently in Roanoke, Va., was the ceremony honoring the past chairmen of the section. In addition, this 25th meeting was treated by the presentation of some pertinent papers covering the water supply and treatment field. For the benefit of our readers, we have prepared abstracts of these papers and their salient points of interest.

SLUDGE CONTRACT CLARIFICATION UNITS were discussed by Mr. H. G. Ragland, Jr., Clarksville Finishing Plant, Division of Burlington Industries, Clarksville, Virginia. This dying and finishing plant began operation in 1947 including provision of complete water and waste treatment facilities. Provision was made to handle both industrial and sanitary wastes. Water is obtained from the Roanoke river which has wide ranges in turbidity having peaked as high as 4,000 ppm. This turbidity is leveled out by use of Bugg's Island Lake, completed in 1953. This has rendered a maximum turbidity of 600 ppm, but created algae problems .Activated carbon is used to combat the taste problem resulting.

The water treatment plant has two 2100 gpm Accelators each 38' in diameter by 13'6" deep. These units adjust well to changes in turbidity loading. The plant is equipped with 8 200-square feet filters, designed for two gallon/sq. ft/minute. Chlorine is added following clarification and carries through the sand filters into the clear well. Plant service water is treated with cation softening units.

Turbidity of the filter influent water averages 10 ppm. Back wash cycles are 80 hours or 8 feet less of head.

SHORT SCHOOL COMMITTEE REPORT by J. G. Jones, Lynchburg, Virginia pointed out that 113 people attended the VPI session during the summer of 1959. The school extended for five days following which exams were given. Certificates were given to 12 water plant and 12 sewage plant operators.

NEW AIDS TO COAGULATION were discussed by Mr. C. P. Blakeley, Hagen Chemicals and Controls, Inc., Pittsburgh, Pennsylvania. Polyelectrolytes-organic polymers plus clay, ground sand, lime, etc. come into use as aids to coagulation. Reasons for their success are not clearly known, but could be due to charges which are adsorbed or suspended. A successful coagulant aid should increase the speed of floc formation, as well as its weight and size. These compounds can rarely be used successfully as primary coagulants.

Coagulant aids are ordinarily successful in color removal, color carrying a negative charge. A reduction in pH is often necessary to increase the number of positive charges available.

There are 30 coagulant aids available, some being investigated for toxity. In practice, dosages would differ between conventional settling basins and upflow or solids contact units. Jar tests are the best means of determining dosages when accurately used. Clean glassware, mixing equipment, reagents from plant stock, (accurately prepared) temperature, parallel to plant mixing time, flocculation and settling periods are all important factors in jar test investigations. Research may produce new techniques which will supplement or replace the jar test as a test device.

WATER RATES—A PANEL DISCUSSION. Mr. R. D. Wright, Lynchburg, Virginia pointed out that rates should be adequate, though the public ordinarily has no real conception of what is truly involved. Further education is needed regarding pipe and labor costs which have undergone high percentage increases. The consumer expects and demands more service, so that a 75% rate increase was necessary in the fall of 1955.

Mr. M. L. West of Kingsport, Tenn. reported that service is rendered to 40,000 persons in Kingsport. Most industries have their own process water treatment plants.
In 1957 Kingsport built a one-million dollar sewage treatment plant. An increase in water rates in 1955 permitted payment of 100,000 dollars in 1957 on the sewage plant indebtedness. Mr. West believes that water rates should show a profit in every bracket.

Mr. E. C. Coalson, Bristol, Virginia is responsible for all utilities. His studies indicate that water is sold at too low price. Calculations for his community indicate that water is delivered to the for 6c per ton.

WATER FOR SUBURBIA—AUTHORITY APPROACH TO THE PROBLEM was described by J. J. Corbalis, Jr. Fairfax County Water Authority. The current population of Fairfax County is 232,000 with growth expected to reach 407,500 by 1970 and 700,000 by the year 2000. The area is suburban to Washington, D. C. and is an important part of the metropolitan area.

Three sources of water are presently being utilized in the area, the Potomac River, Occoquan Creek and Goose Creek. Ground water sources are generally filled to produce sustained yields and are not considered reliable sources for meeting future needs.

In addition to the Authority, there are four municipalities and fifteen to twenty privately owned companies supplying water in Fairfax County. This produces differences in the quality of service and in charges made for service. In addition there are deficiencies in quantities and water pressures available. There is no uniformity with respect to kinds of pipe, walves or hydrants. Few interconnections between systems exist.

This background prompted the Board of County Supervisors to create the Fairfax County Water Authority in 1957. This charter provides for "the acquisition, construction, operation and maintenance of an integrated water system for supplying and distributing water in Fairfax County". The Authority is a non-profit instrumentality designed to exercise public and essential governmental functions. Affairs are ad-

PAST CHAIRMEN, Virginia Section AWWA were honored at 25th anniversary meeting.

ministered by a board of five members for terms not to exceed four years each. It has no authority to levy taxes or assessments and the obligations of an authority do not become obligations of the participating unit or units. The Authority has purchased the Annandale Water Company, Inc. The system serves approximately 15,000 persons and is located so as to permit development of adjacent areas and integration into the comprehensive system. In order to support the financing program ($3,000,000 revenue bonds) existing rates of the company had to be increased approximately 30%. This figure is about 5% less than those contained in an application made by the water company to the state Corporation Commission.

The Authority received a committment to supply water to the new Dulles International Airport being constructed on 9,000 acres located northwesterly in Fairfax County and extending into adjoining loudoun County. Plans for 4.8 million dollar water system are being made to come up to the water required at the airport before January 1, 1961. The system includes use of a new 36" Potomac River crossing owned by the City of Falls Church and providing surplus capacity suitable for the Authority's needs until about 1970. The northerly area system will comprise a 24 mile transmission main, two pumping stations and elevated storage facilities—all capable of meeting the expected needs of the period 1975-80.

The Authority has negotiated unsuccessfully for the purchase of The Alexandria Water Company jointly with the City of Alexandria. Refusal of the Company of a 20 million dollar offer of purchase, the Authority and the City have each authorized the institution of condemnation proceedings. These apply to parts of the system located within the county and the city respectively. Such procedure has not been attempted heretofor and many interesting questions are expected to be developed in the course of the proceedings and a precedent will undoubtedly be established for all who may become involved in like circumstances.

The intention of acquisition of privately owned systems has not been without criticism. One expression has been that the procedure is a destruction of the free enterprise system and that consumers would be financially worse off if such a program were followed. The Authority believes that such action is indicated in order to achieve a comprehensive system free of the deficiencies attached to the present independantly operated systems. Capabilities to meet the needs resulting from population growth must be provided. While the program's cost will not be "cheap", relief will be realized from local, state and federal taxes and stockholder returns.

The problem of providing water for suburbia can be solved by the Authority approach. Compared to the usual approach under public ownership through a department of the town, city, or county government, there are three distinguishing features. They are:

(1) An Authority is a single purpose, business-like organization which is available to consider day-to-day and long range problems and may gear itself to solutions with as little or as much dispatch as circumstances warrant.

(2) An Authority possesses more liberal contractual powers which are of particular value in the development of joint-use programs.

(3) An Authority can arrange its financing without the express approval of a referendum.

The Authority approach to the problem of providing "water for Suburbia" is by no means a panacea. However, experience of the past two years in Fairfax County shows promise that it can be successful. The approach will be exposed to practically all of the circumstances encountered in the development of a comprehensive water system.

AUTOMATIC CONTROLS FOR WATER AND SEWAGE TREATMENT PLANTS were discussed by W. J. Firth, Infilco, Inc. A water treatment plant may be compared to a chemical plant, where a raw product that is not acceptable is converted to one that is satisfactory and satisfies a need. While storage areas and other water supply facilities are important, it must be remembered that the water treatment plant and man or men to operate it are required if maximum utilization may be made of the supply facilities. Automatic features in a plant greatly assist the operator to perform his task. Automatic control and the extent of its use in a plant depends greatly on the economics of a system under study. A small town with little possibility of increasing income, might be happy to get the additional service of a man part time, if the plant is automated. Control on the raw water influent will enable the plant to run smoothly with a minimum amount of attention or work by the operator.

V. W. L.

Photo courtesy U. S. Pipe & Foundry

▲ 16-in. water supply line being installed between filtration plant and Alexander City, Ala.

Further evidence of automation, and plants designed to operate with automatic controls, are shown in this continued photo review of . . .

New Equipment, Plants, and Installations

PART II

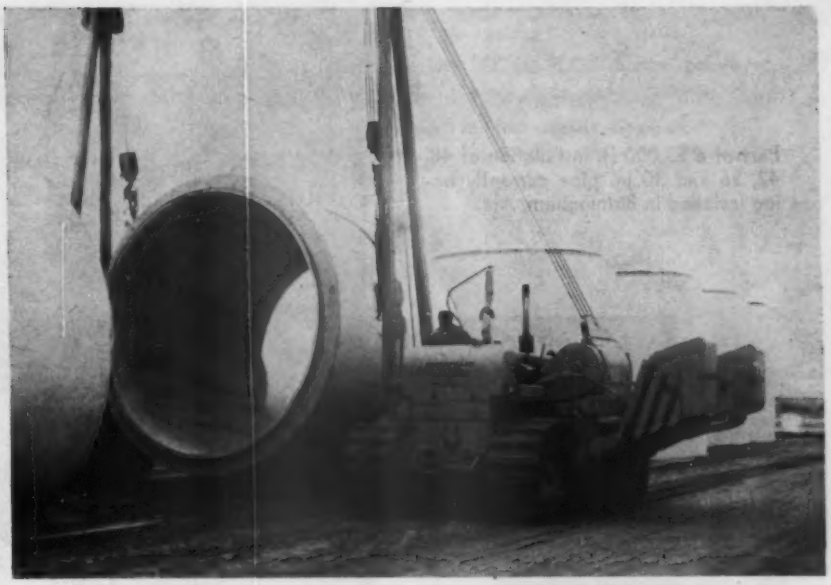
EDITOR'S NOTE: Due to space limitations and unavoidable delays, this Part II is a continuation of Part I (pg. 19) that appeared in our January Review issue. This part includes photos, some late arrivals, which we were unable to prepare in time for the January issue.

Photo courtesy Eimco Process Engineers

Reactor-clarifier features a conical reaction well in this 50-ft. diameter unit installed at a western industrial plant. ►

Photo courtesy Caterpillar

Special pipelaying equipment ► is needed to handle this heavy pre-cast concrete pipe for the Colorado River Aqueduct. Pipe is 13 to 13.5 ft. in diameter and each section weighs 63 to 68 tons.



▼ Vertically mounted 12 x 10 dry pit pumps installed at West Allis pumping station.

Photo courtesy Allis-Chalmers Mfg. Co.

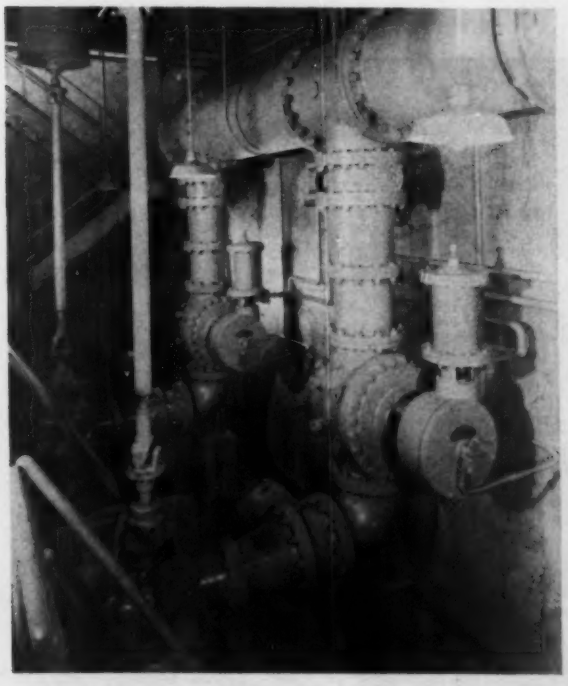


Photo courtesy Pittsburgh-Des Moines Steel Co.

▲ A 750,000 gal. radial cone tank serves Independence, Kansas. Tank is 73 ft. in diameter and 101.6 ft. to the bottom.

Photo courtesy Dorr-Oliver, Inc.

Small plant—big results. Located at Baden, ► Pa., plant handles a flow of 0.87 mgd and utilizes two Type A Clarigesters.

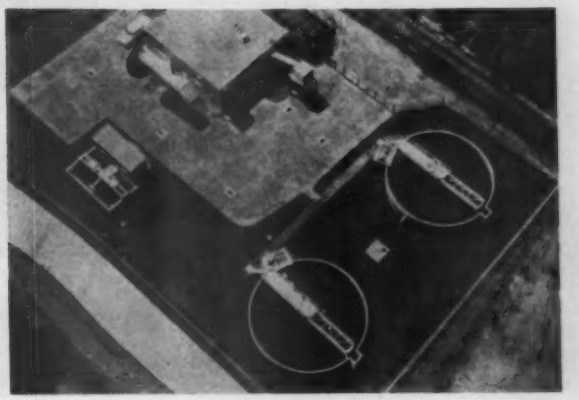


Photo courtesy American Cast Iron Pipe Co.

Part of a 53,000 ft. installation of 48, 42, 36 and 30 in. pipe currently being installed in Birmingham, Ala. ►

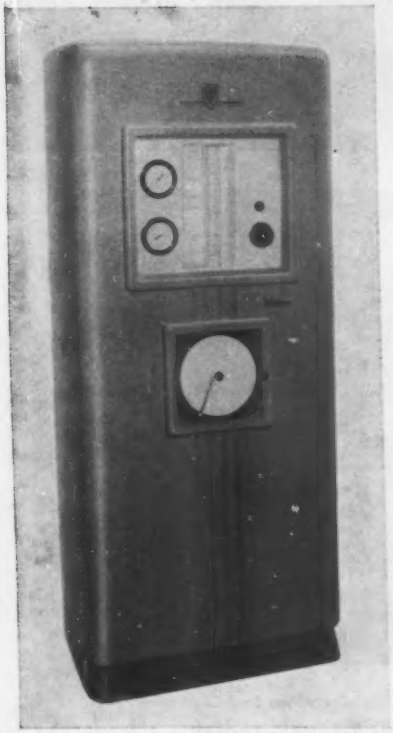


Photo courtesy Wallace & Tiernan, Inc.

▲ Chlorine flow recorder mounted in a v-notch chlorinator.

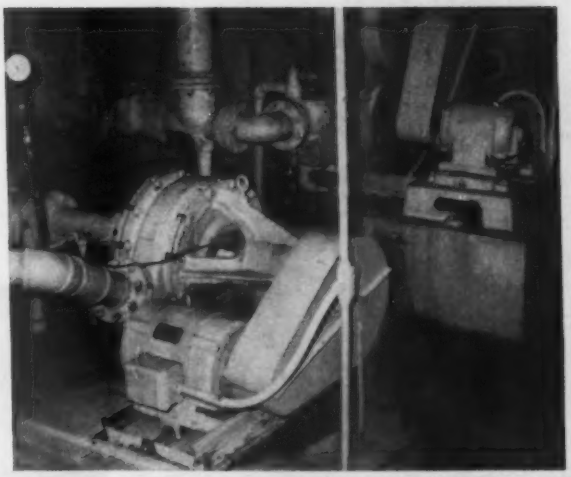


Photo courtesy Western Machinery

▲ One of 12 four-in. Wemco Torque-Flow pumps handling sludge at the new El Paso, Texas sewage treatment plant.

Photo courtesy Eimco Process Engineers

◄ One of two 150 ft. biological filters serving Riverside, Calif. The filters feature Eimco high-rate rotary distributors.

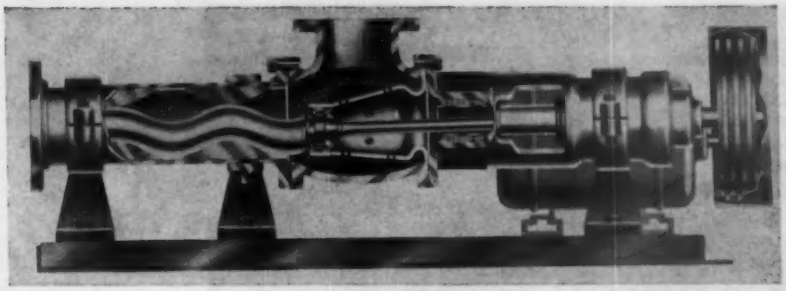


Photo courtesy Chicago Pump Co.

◄ "SCRU-FLO" Screw conveyor clog-proof sludge pumps.

Photo courtesy Homestead Valve Mfg. Co.

Three 6-in. full pipe area lubricated plug valves are used on gas lines to and from meter in this sewage treatment plant. ►

An "accelerator" clarifier and filter installed at Great Northern Paper Co., Millinocket, Maine for water treatment. ▼

Photo courtesy INFILCO, Inc.

Photo courtesy Pacific Flush Tank Co.

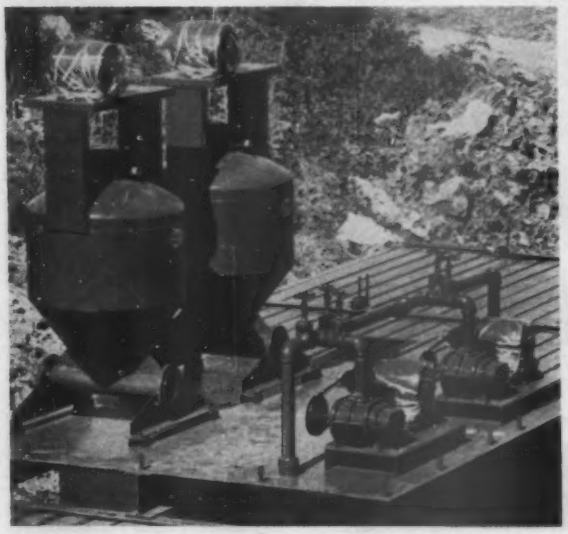
▲ New sewage treatment plant for Hamilton, Ohio.

Photo courtesy Chicago Bridge & Iron Co.

◄ 6,000,000 gal reservoir for the City of Albuquerque, N. M. Tank has a diameter of 80 ft. and is 31.8 ft. high.

▼ A pneumatic ejector lift station being installed, has a capacity of 30 to 100 gpm.

Photo courtesy Smith & Loveless, Inc.



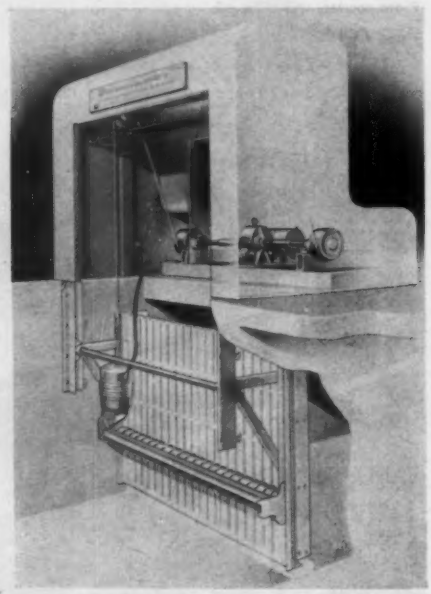


Photo courtesy Chicago Pump Co.

▲ New model Barminutor® featuring all-electric drive.

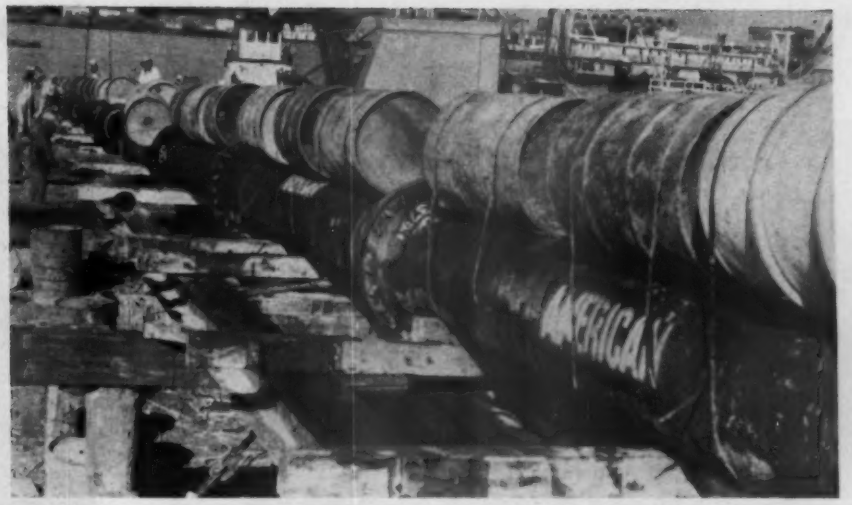


Photo courtesy American Cast Iron Pipe Co.

▲ **Molox ball joint pipe was used to traverse Dog River as part of Mobile, Alabama's water expansion program.**

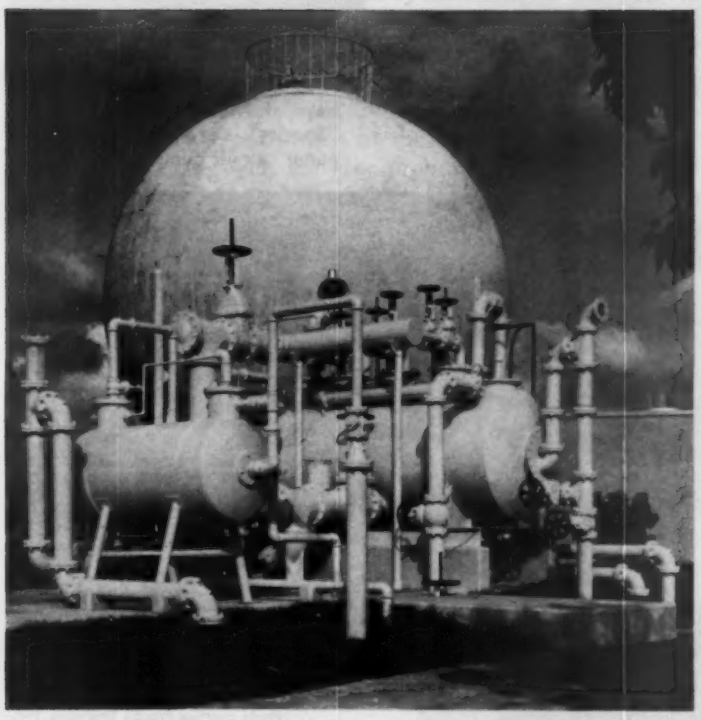


Photo courtesy Pacific Flush Tank Co.

◄ **Gas scrubber at Miami, Fla. sewage treatment plant. Pilot plant in foreground has been converted now to provide additional capacity.**

Photo courtesy Link-Belt Co.

New Clearwater, Fla. sewage plant uses 12 longitudinal and 6 cross straightline sludge collectors in final settling tanks. ►

Photo courtesy Royer Foundry & Machine Co.

Once through shredder reduces sludge to correct size for sale as an "organic soil builder" at Madison-Chattham, N. Y. sewage plant. ▲

Photo courtesy Walker Process Equipment, Inc.

▲ Fine activated sludge aeration bays at Mansfield, Ohio feature "Sparjer" aerators and "Airo-pump" air lift pumps.

Photo courtesy Process Engineers, Inc. Div. of Eimco Corp.

▲ Squaw Valley sewage plant features enclosed 50 ft. rotary distributor. Air is introduced beneath filter rock and removed via a duct in ceiling.

Photo courtesy INFILCO, Inc.

◄ 8 mgd "aero-accelerator" sewage treatment plant at Schwaebisch-Gmund, Germany.

A modified well point method, 42 in. clay pipe and a new jointing method were developed for Los Angeles . . .

Ocean Front Sewer Project

by E. G. STUDLEY
Division Engineer
Sewer Design Division
City of Los Angeles, Calif

EDITOR'S NOTE: Installation of a major sewer line in ocean areas present almost enough problems when all of the complications of a high water table, and the others normal to sewer work close to the water are considered. In southern California it is necessary to add the sulfide corrosion problem which requires either protection of the sewer or the use of resistant materials as well as particular care to prevent attacking of the joints. For the 3.5 mile project discussed in this article the engineering department of the city of Los Angeles developed methods to cope with all of these problems. To lower the high water table enough not only to permit working in the trench but also to insure corrosion resistant joints a modification of the well point method was developed. Working with the clay pipe manufacturers resulted in the production of 42 in. bell and spigot clay pipe, a size never before used in the city and one which had not been made in this country for years. The problem of making resistant joints in this size pipe was also overcome by the development of the diaper joint method. These methods will be of definite interest to those engaged in this type of work.

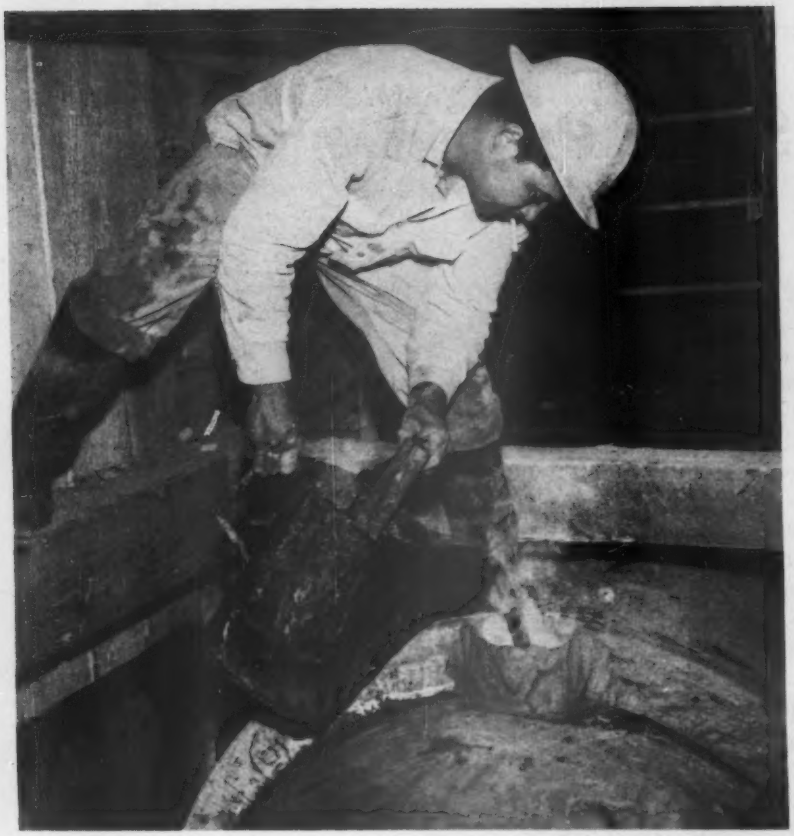
■ INSTALLATION OF AN OCEAN front sanitary sewer system such as the one now being installed in the City of Los Angeles area, poses a multiplicity of problems to the design engineer, the contractor and the pipe manufacturer. In this particular case, the solution of these problems has led to several new developments in sewer installations including the first use on the west coast of 42 in. diameter bell and spigot clay pipe.

The Los Angeles installation is a $3,960,000 sewer project consisting of gravity lines, a pumping station and an extensive force main to serve the ocean front area of Venice, the City of Santa Monica and areas tributary thereto. This sewer will extend from the southern boundary of Santa Monica to the outfall sewer at Playa del Rey—a distance of almost 3.5 miles. The new sewer became necessary when the existing system had to be abandoned to make way for the new small boat harbor at Marina Del Rey.

Financing of the Los Angeles project was provided by agreements

Courtesy of Gladding, McBean & Co.

FIG. 1. THE INSTALLATION OF THE WELL POINTS in the 7 ft cut as shown here permitted lowering of the water level to a maximum of 25 ft.



Courtesy of Gladding, McBean & Co.

FIG. 2. HOT SEWER JOINT COMPOUND being poured into the clay pouring gate of a diaper formed joint.

entered into by the Cities of Los Angeles and Santa Monica and the County of Los Angeles. By these agreements, the City of Los Angeles is appropriating $1,838,000, the City of Santa Monica $1,222,000 and the County of Los Angeles $900,000. Money for these appropriations came from bond issues approved for sewer projects in the Cities of Los Angeles and Santa Monica and from revenue bonds, which will be sold by the county. Pending the sale of these bonds, the city advanced the county's share.

Corrosion

The history of large sewers serving the city of Los Angeles has been one of corrosion and continual expense to combat this corrosion. The excessive corrosive conditions are caused by the large amounts of hydrogen sulfide generated in the lines. When these sulfide gases oxidize to sulfuric acid, they attack unprotected concrete surfaces. Under these conditions the present design practice of the city specified that clay pipe is to be used wherever available in the required diameter. Whenever clay pipe is not available, the inner surfaces of concrete sewers above the low flow line must have protective lining.

On the basis of the city's good experience with clay pipe up to 39 in. in diameter, and with several projects in the offing requiring a larger diameter, and with several projects in the offering requiring a larger diameter pipe, the City Engineer asked the clay pipe manufacturers if they could make a 42 in. diameter clay pipe. In addition, since the corrosive conditions would require that the joints also be corrosive resistant and still permit flexibility, the city required the pipe to be made with bell and spigot joints. None of this size and type pipe had been made in this country in recent years and it never had any of it been installed on the west coast. However, ceramic technicians solved the manufacturing problems and, as a result, 42 in. diameter vitrified clay pipe with a bell and spigot is now available and is being used on this project.

Another interesting design feature of clay pipe section is the curves at each end. The radius at the upper end of the line is 61 ft while the radius is 100 ft at the lower end where it enters the new interceptor. All joints are limited to 5° deflection and pipe is beveled to provide tight fitting joints. The design engineers specified curves in order to reduce water turbulence at junction structures. This, in turn, reduces the release of hydrogen sulfide gas and the subsequent corrosive effects on the junction structure.

Installation

The design engineers and the pipe manufacturer having successfully solved their problems, the product was now turned over to the contractor. The magnitude of their problems can be realized from the fact that the interceptor is being laid 20 ft below the ground water level and close to the ocean front. In addition, the specifications state that the water level must be lowered two feet below the trench bottom in order to insure obtaining the best possible hot-pour joint. Further complicating one contractor's job were several thousand feet of his part of the interceptor which are located in the middle of the Venice Grand Canal.

In studying the de-watering problem, it was evident that use of a well point system installed at the surface level would not work since the maximum practical draw down of the well point system is 17 to 18 ft. This problem was solved by making an initial cut of 7 ft, and installing the well point system at that level, which permitted lowering of the water level to a maximum of 25 ft below ground surface. Diaphragm pumps were also used in selected locations to assist the well points in completing the dewatering.

Once the water level was lowered, trenching could begin. Instead of making the usual V-cut in an installation of this kind, thereby losing most of the street, one contractor used a backhoe with a shield attachment. The trench was held open while solid sheeting was installed with pneumatic rams. This method, which made possible a narrow trench, led to a mini-

mum of interference with traffic on a busy thoroughfare.

Jointing

For laying the clay pipe line, a new method of retaining the hot-pour compound in the annular space was developed. Instead of the traditional running rope, a piece of sail cloth about 8 in. wide and long enough to go around the circumference of the pipe is used. A pocket is sewn on each longitudinal edge of the cloth, and steel straps are threaded through these seams. The cloth is then wrapped around the pipe with one edge going around the bell and the other edge around the adjacent spigot. The steel bands are drawn up tight with conventional strapping equipment, and a small gap is left between the ends of the cloth at the top of the pipe. A clay pouring gate is then formed in the regular manner at the opening, and the hot compound is poured in. These so-called "diapers" are then left in place and considered expendable.

This method is working satisfactorily and is considerably cheaper, as the materials are relatively inexpensive and a great deal of time is saved over the laborious task of installing asbestos running ropes on large diameter pipe. The contractor has also discovered that the sail cloth "diaper" allows entrapped air to escape through the pores of the material. This eliminates possible porosity due to entrained air. Another advantage of this method is the tension which builds up and assists in overcoming shrinkage of the hot pour material as it cools.

The Venice installation is an excellent example of the value of tackling each sewer design as a special problem rather than using stereotyped solutions. Sewer design engineers can, by progressive engineering thinking based on sound principles, originate new developments to overcome specific job problems. The 42 in. clay pipe was developed by Gladding, McBean and Co. The so-called diaper jointing method is the work of Drommond & Bronneck and the Hubbard Co.

Courtesy of Gladding, McBean & Co.

FIG. 3. 42 IN. BELL AND SPIGOT CLAY PIPE resting on blocks in preparation for construction of the concrete cradle.

Americans Help India Study Water and Sanitation

University of Michigan's Professor Earnest Boyce, chairman of the civil engineering department, heads a three man team of American engineers chosen for an inspection tour of the sanitary and water supply problems in the villages of India from February through April of this year.

The other two team members are Morton W. Lieberman of Tibitts, Abbett, McCarthy and Stratton, consulting engineering firm of New York City, and Dwight F. Metzler of the Kansas State Board of Health.

Along with Indian government representatives, the team will make two to three week inspection field trips to the east, south and west portions of India. After these trips they will return to New Delhi to prepare reports evaluating the accomplishments of India's second, five-year plan for village sanitation and water supply, and even make recommendations for a third, five-year plan.

Clarence W. Bogenhagen Dies

Mr. Clarence W. Bogenhagen, Superintendent of the Fond du Lac, Wis., Sewage Treatment Plant, died February 11. He was the Secretary-Treasurer of the Conference of Wisconsin Sewage Works Operators, an active member of the Central States Sewage and Industrial Wastes Association, and a member of the Federation of Sewage and Industrial Wastes Association (Water Pollution Control Federation).

Large and small water works, also industry, find many applications for . . .

Liquid Chemical Feeders

by
VIRGIL W. LANGWORTHY,
Field Editor,
WATER & SEWAGE WORKS

AUTHOR'S NOTE: In past years the feeding of chemicals in liquid form was more popular than it is today. With the improvement of dry chemical feeders to the point where they are precise, accurate, reliable pieces of machinery, the feeding of chemicals in dry form with its basic advantages has been utilized more and more by water works engineers. There are sufficient applications of liquid and slurry feeding today however, to make a thorough investigation of this subject worth-while. It is the purpose of this paper to review the fundamentals of feeding liquids and slurries.

■ APPLICATIONS for liquid chemical feeders come mostly from the need for feeding small amounts of chemical. In small water treatment plants large dry chemical feeders can neither be afforded nor are necessary. A small liquid feeder feeding a few gallons of chemical each day is the logical choice for this type of plant. Even in the large treatment plants with their large banks of dry chemical feeders, the need for liquid chemical feeders for special jobs is present. Feeding small amounts of calgon, hydrofluosilicic acid, lime slurry, or sulfuric acid is accurately accomplished by liquid feeders. A third area of application of liquid feeders is in the industrial field. Industrial chemical engineers are very prone to select chemicals in liquid or slurry form. Therefore, one of the widest uses of liquid feeders is in industry.

General Considerations

No matter what kind of chemical feeder is to be installed, liquid, slurry or dry, the following items must be given close attention. One of the most important considerations is a study of the installation conditions. How much space is available for the feeder to be installed, how will the chemicals be loaded into the feeder, how long will the solution lines be, how will the chemical be mixed with the water to be treated? The answers to these questions often will dictate what type of chemical feeder must be used. There are other necessary requirements for proper machine selection, however. One other is that the selected feeder must have adequate capacity to cover the range of dosages expected. As the flow in a water treatment plant varies, the chemical dosage also must vary and the chemical feeder must be able to accurately deliver chemical over the entire design range. Still another criterion of chemical feeder selection is dependability. The feeder that will do the required job with the least amount of maintenance is the feeder that should be used. Finally, the nature of the chemical to be fed will have a great influence on the final selection of the chemical feeder.

Type of Feeders

If the considerations of space available, range required, low maintenance, and the chemical to be fed have been investigated and the choice is a liquid or slurry feeder, there are two types of feeders which are available, gravity feed and pressure feed.

Gravity Feed

Liquid feeders which depend on gravity are of two types; one type depends on the maintenance of a head difference which causes the liquid to flow at a known rate through an orifice. The other type depends on gravity to conduct the measured liquid to the point of application.

Orifice feeders are either of the constant orifice or variable orifice type. If the orifice has a fixed calibrated opening and the liquid falls through a constant head, the flow will be constant and known. With the flow known, the strength of the solution may be adjusted so that the proper quantity of chemical is fed per unit time. If the flow is to be changed, the head on the orifice or the orifice size must be changed.

An easier way to change the flow is to change the opening of the orifice by the use of a variable orifice device such as a rotameter. The rotameter is a transparent, conical tube containing a float. The higher the float rides in the cone, the greater is the area through which the liquid passes and the greater is the flow delivered. The rotameter is calibrated so that for a given head the position of the float measures the flow passing through the device.

Another type of gravity feeder is the Rotodip. In this type of feeder the dipper wheel scoops a given volume of liquid from the constant level tank and pours it into a collector where it flows by gravity to the point of application. The volume of liquid delivered can be varied by changing the speed of rotation of the dipper wheel. The level of liquid in the tank is maintained by pumped recirculation through an overflow if the stor-

age tank is below the feeder as shown in Fig. 1 or by a float valve if the storage tank is above the feeder.

Pressure Feed

Pressure liquid chemical feeders differ from gravity feeders in the method of conveying the liquid to the point of application. In a pressure feed device the liquid is pumped under pressure into the main stream of water to be treated. This pumping can be accomplished by diaphragm, piston, gear, or rotor positive displacement pumps.

The principle of each of these feeders is the same. Each oscillation of the diaphragm, stroke of the piston, or revolution of the gear or rotor, pumps a given volume under pressure. The amount of liquid being fed is varied by controlling the rate of pumping. This can be accomplished by changing the speed at which the feeder is operating or in the case of the diaphragm or piston feeder, changing the displacement of the diaphragm or piston.

Other Considerations

Capacity Required

The capacity of a chemical feeder should be calculated as the number of pounds of dry chemical that must be fed per day. This can be converted to a liquid volume through the knowledge of the strength of the feed solution. The rate of feeding is not steady through the day but usually varies as the flow varies. Flow is usually measured in million gallons per day (mgd) which is both a rate and a total quantity. It is sometimes confusing to consider that water may be pumped at the rate of 10 mgd when the total daily flow is only 5 mgd. This is exactly analogous to driving a car 60 mph but traveling only 30 miles in an hour. One figure is a rate, the other figure is a total quantity.

Treatment doses are often given as concentrations, parts per million (ppm) or to be more modern, milligrams per liter (mg/L), or grains per gallon (gpg). These dosages are the final concentrations after mixing the chemical with the entire water stream and are of little use in determining how much chemical should be fed. The amount of chemical to be fed can be determined by converting the recommended dosage to pounds of chemical fed per million gallons of flow. This may be done by use of factors contained in Table 1.

Table 1

Useful Conversion Factors

Dosage	Feed
For each mg/L	8.34 lb/mgd of dry chemical
For each gpg	142.61 lb/mgd of dry chemical

The final conversion from pounds per million gallons to gallons per day of liquid chemical fed is made by knowing the concentration of the stock solution being fed. This concentration is most conveniently expressed as pounds per gallon. Other methods of expression which may be converted to pounds per gallon are percent by weight, specific gravity, and specific gravity on the Baume scale.

Operation Means

The simplest method of control for chemical feeders is to use manual control right at the machine. This requires great attention if numerous feed rate changes are to be made during the day. This is also very inconvenient if the chemical feeder is not centrally located. An improvement on this method is to have remote manual control so that the machine may be operated from a central location.

The most sophisticated method of controlling a liquid feeder is having it operate automatically, proportionally paced to the flow of the water to be treated. A differential producer is placed in the line and the changing head loss caused by different flow rates is transmitted to a sensing unit which increases or decreases the rate of flow from the feeder. Means of transmission can be air, electricity, or water.

Points of Application

There are several places where chemicals can, under certain circumstances, be added. Chemical feeders may be located ahead of the plant to give pre-plant treatment, they may be in the plant to give in-plant treatment, or they may be located after the plant to give post-plant treatment. A final location for chemical feeders is out in the distribution system. These may be many miles from the treatment plant.

Design Considerations

There are several design factors which must be taken into consideration if a workable chemical feed system is to be installed. One of these is chemical storage area. Chemicals come in bags, drums or carboys or are shipped in tank trucks or tank cars. Calculations must be made to determine chemical requirements and chemical shipments and provide ample storage space to keep the chemicals required between shipments.

Another factor, which must be considered, is adequate handling equipment with which to unload and move the chemicals when such handling is required. Elevators and hoists are used for unloading while movement of the chemicals can be by hand trucks, overhead monorails or pallets and fork lifts. If these facilities are inadequate, the handling of chemicals can be a nightmare.

Proper construction of the actual feeding equipment, the sloution tanks, the feeder and accessories, and the solution lines or troughs must be considered especially with respect to corrosion resistance. Many liquid chemicals such as sulfuric acid are very corrosive, and the equipment must be adequately protected.

The head conditions must be given careful consideration. Ample head must be available to get the liquid chemical from the storage tank through the feeder, and enough head must remain to let the measured flow from the feeder to the point of application. Adequate head is a must for successful liquid chemical feeding.

Tatlow Elected Head of A.I.C.E.

The American Institute of Consulting Engineers has announced the election of Richard H. Tatlow, III, of New York City as President of the organization, succeeding George S. Richardson of Pittsburgh, Pa. Mr. Tatlow is the president of Abbott, Markt and Company, New York engineers and designers.

Others elected as members of the Governing Council are: John G. Frost, Partner, Wiggs, Walford, Frost and Lindsay, Montreal; Ray E. Lawrence, Partner, Black and Veatch, Kansas City, Mo.; and Gilbert I. Ross, Partner, Ross and Company, New York City.

REPORT FROM ABROAD

Separated industrial and residential area assists . . .

Research in Water Pollution

by F. C. LIVINGSTONE, London, England

EDITOR'S NOTE: The siting of a laboratory in a fast-growing suburb outside of London has made it possible to investigate, individually, both domestic and industrial waste water flow. The author reports briefly on laboratory research into biological degradation of synthetic detergents, characteristics of domestic sewage flow, solving tannery wastes problems, and treating cyanide wastes.

■ THE PROBLEMS of water pollution are becoming acute in most civilized countries because of the rapid increase in size of many cities and a similar spread of industry. But in no country is the problem more acute, or more closely studied, than in Britain. Here the comparatively small size of the country and the expansion of the non-agricultural population and industry provide ample reason for intensive research in all phases of water pollution.

For more than a quarter of a century, the Government's Department of Scientific and Industrial Research has maintained a special Water Pollution Research Laboratory, which is charged with finding quick and efficient answers to problems as they arise.

About five years ago, this laboratory was moved to a new site in the still, fast-growing satellite town of Stevenage, about 30 miles north of London. This siting has proved most effective since it permits individual studies to be made of industrial and domestic water usage and waste. The layout of this "new town" provides for the complete segregation of the industrial section from the residential parts. This has enabled field stations to be established to watch the sewers of each.

Synthetic Detergents

In its latest report, this laboratory offers solutions to some of the most urgent problems facing sanitary engineers. One which gets special mention in the report is that of removing synthetic detergents from streams and sewers. A special pilot plant was set up during the year to tackle this problem.

Three years ago, when synthetic detergents were proving to provide many major difficulties for sanitary engineers, manufacturers of household synthetic detergents were urged to investigate "the feasibility of producing efficient washing products based on materials which could be readily oxidized or eliminated, and would not cause persistent foaming, during sewage treatment by present available methods."

As a result of much work by detergent manufacturers, a new anionic surface-active material has been developed. Tests have been made at the laboratory to compare the behavior, during biological treatment of sewage, of this new material with that of the type in present-day use.

In these tests, 12 similar percolating filters (each 6 ft. deep and 6 inches in diameter) and eight small continuous-flow activated-sludge units, were operated to simulate as closely as possible conditions obtained at sewage works. The detergent was added to detergent-free sewage (about 240 gal. being prepared daily) which was treated in some of these experimental plants; other units were used as controls treating the detergent-free sewage only.

It was found that when a steady state had been reached in the treatment processes, about 90 per cent of the new type of detergent was removed, compared with about 68 per cent of the type of material at present marketed. This would mean that in settled sewage containing 10 mg/L of the present type of surface-active material, about 3.2 mg/L would appear in the effluent. However, if the active material in the sewage was of the new type, then the concentration in the effluent would be only about 1 mg/L.

The amount of foam produced by the effluent from the treatment of sewage containing the new detergent was no greater than that formed by the effluent from the treatment of sewage which contained no detergent.

On the subject of foaming of liquids containing synthetic detergents, the laboratory's scientists point out that foaming is probably the most conspicuous effect of the present synthetic detergents in sewage, both at sewage-treatment works and in rivers to which sewage effluents are discharged.

A study has been made of the amount of foam produced in relation to the character of the liquid and concentration of detergent using a simple test developed for comparing the foaming tendencies of samples of sewage and effluent. The method, which measures the height of foam above a column of liquid, aerated under standard conditions, has been adapted for the rapid routine testing of samples containing synthetic detergents; the reproducibility of the method is good.

When the liquid is allowed to foam to its maximum height before the column breaks and collapses, the amount of foam produced in a given liquid increases linearly with the concentration of active agent. The tendency to foam is greatest in clean water, becoming progressively less as the amount of polluting matter in the liquid is increased. There is a constant relation between the weight of active matter lost from solution and the volume of foam formed.

The active ingredient of the synthetic detergents commonly used by housewives and therefore present in sewage is an anionic surface-active material. Compounds of this type form a complex with methylene blue dye which is soluble in chloroform.

The method used for determining synthetic detergents in liquids at the laboratory is: a solution of methylene blue is added to a suitable volume of sample and the complex formed is extracted by shaking with chloroform. The chloroform layer is then separated and the blue color produced in it, which is proportional to the concentration of detergent, is measured with a photoelectric absorptiometer or spectrophotometer using an orange filter and wave length of 650 mu.

Per Capita Sewage Flow

As previously explained, the scientists are able to make separate studies of industrial and domestic sewage. Crossing the site of the laboratory is a sewer which drains a residential district of Stevenage New Town. The sewage, which is used for experimental purposes in the laboratory, contains no industrial wastes and no surface drainage.

The opportunity has been taken of examining variations in the rate of flow and composition of this sewage throughout several periods of 24 hours. The highest rates of flow, about three times the average, occurred before noon. The greatest polluting strength and concentrations of anionic detergent were observed around noon and were about twice the respective average values. Peak ammonia concentrations, however, occurred at about 8 a.m. with smaller peak at midnight.

Since the number of people served by the sewer is accurately known the information collected in the surveys has given fairly precise values for the volume of sewage (25 gal.) and the oxygen demand (0.1 lb) discharged daily by one person.

Industrial Wastes

Among the many industrial water pollution problems were those created by waste from tanneries and those containing cyanide.

Waste waters from the tanning of leather are well known to be highly polluting. Some liquors contain a high concentration of suspended matter and are strongly alkaline owing to the presence of free lime; they may also contain appreciable concentrations of sodium sulphide. Experience has shown that, if these liquors are discharged to a sewer, troublesome deposits of calcium carbonate may form; the sewer atmosphere may be made toxic to workmen owing to the presence of hydrogen sulphide, and concrete and metal work in the sewerage system may be attacked or heavily corroded. Other liquors may contain metal salts which interfere with the biological treatment of sewage.

The laboratory has investigated possible methods of pretreatment to remove suspended matter, toxic metals, and sulphide and to neutralize the wastes at the tannery. Sedimentation, followed by chlorination, would be effective and would perhaps be the most simple method but is, unfortunately, very costly.

A possibly cheaper method might be to neutralize the settled wastes with carbon dioxide in the form of flue gas which could be bubbled through the wastes. Lime would be precipitated as calcium carbonate and, if the process were continued, sulphide would be stripped out. It would, of course, be necessary to ensure that no nuisance arose on account of the presence of hydrogen sulphide in the atmosphere. Ways of doing this are being studied.

A method, effective on a small scale, is to pass the waste gases containing hydrogen sulphide into a coke-packed filter, irrigated with a mixture of less polluting tannery wastes. Hydrogen sulphide is absorbed and oxidized by bacteria to sulphuric acid. A possible difficulty, however, is that the efficiency of the process falls off appreciably at low temperatures.

Experiments are also being made on treatment of a mixture of settled tannery wastes on a percolating filter, using a high rate of recirculation of effluent in order to reduce the alkalinity of the waste water applied. This would be an effective and convenient form of pretreatment but for the fact that chalk is deposited in the filter and might, in time, cause blockage. At a loading of 0.29 lb BOD cu/yd/day, 95 per cent of the sulphide, 80 per cent of the 5-day BOD and 60 per cent of the 4-hour permanganate value is removed.

Another important item of research during the year was the treatment of waste waters containing cyanide. Cyanides are widely used as constituents of electroplating baths for the deposition of zinc, cadmium, copper, and silver. Sodium cyanide, as the fused salt, is also used in a process for the case-hardening of steel components.

Rinsing waters from processes such as these are therefore likely to contain cyanides, both as the simple sodium cyanide, and as complex cyanides of various degrees of stability. In addition, cyanides are also present in certain liquors discharged from gas works and coke ovens.

All cyanides, apart from the most stable complex cyanides such as nickelocyanides and ferrocyanides, are extremely toxic to fish. For example, 0.2 mg/L (as HCN) of a simple cyanide will kill half a batch of rainbow trout in about 11 min. It has also been found that concentrations of about 2 mg/L have an adverse effect on sewage-treatment processes.

The concentration of cyanide in wastes containing simple cyanides and the less stable complex cyanides may be reduced sufficiently to permit discharge to a sewer by treatment with ferrous sulphate and an alkali. For wastes which demand a higher degree of purification, such as those

discharged to small rivers, treatment with chlorine and an alkali has been shown to be very effective.

Rather surprisingly, in view of the harmful effect of cyanide on sewage treatment processes, has been the possibility of treating waste waters containing simple cyanides and the less stable complex cyanides by passage through a percolating filter or by the activated-sludge process. It is possible to build up a biological film which uses the cyanide as a source of carbon.

A pilot plant using this process is at present in operation at the laboratory. It is capable of effecting almost complete removal of cyanide from a solution of sodium cyanide equivalent to 90 mg/L HCN at a rate of flow of 700 gal./cu yd/day, provided that the temperature of the effluent does not fall below 10° C. The temperature is maintained by enclosing the filter in a light shed and by electrical heating of the incoming liquid.

At present a mixture of simple cyanide and complex cyanides of zinc, copper, and cadmium is being treated. About half of the cyanide is being added as simple sodium cyanide. This mixture is much less amenable to treatment than the simple cyanide. To remove 95 per cent of the cyanide applied, it is necessary to reduce the concentration of 60 mg/L as HCN, to reduce the rate of flow to 150 gal./cu yd/day, and to adjust the pH value to 6.5.

It is thought that under certain conditions such biological processes might provide a satisfactory alternative to chemical treatment.

New Stamp to Emphasize Water Conservation

Postmaster General Arthur E. Summerfield has announced that a water conservation 4-cent postage stamp will be issued April 18, 1960 in connection with the Seventh National Watershed Congress in Washington, D. C.

The purpose of the issue, Mr. Summerfield stated, "is to help direct public attention to the urgency of water conservation throughout the nation, with special emphasis on the protection and improvement of our vital water sources—the forests and fields of our upper water sheds where water first falls in the form of rain or snow."

The Postmaster General pointed out that water problems—too much water, too little water or poor quality water—affect every citizen of our country. "Water conservation is, therefore, a matter of interest and concern to everyone and we expect that the distribution of 120,000,000 of these commemorative stamps will help to dramatize that fact."

The three-color stamp was designed by Elmo White of the Department of Agriculture. The left portion of the design features a close-up view of a drop of water falling from a leaf, which symbolizes watershed influences upon water supply. To the right is an actual watershed panorama, with a town and farm in the foreground depending upon the watershed above, with its well-managed farm and forest lands and small dams for flood prevention and water storage.

The forthcoming 4-cent Water Conservation stamp will be produced on the Giori presses of the Bureau of Engraving and Printing in sheets of fifty subjects, arranged horizontally, and measuring 0.84 by 1.44 inches, perforated by the L-type machines, and printed in blue, green and orange brown. The wording "Water Conservation" appears across the top of the stamp with "United States Postage 4c" at the bottom. All lettering is blue with the exception of the word "Water", which is white against a dark blue background. An initial order for 120 million of these stamps has been placed.

Collectors desiring first-day cancellations of the 4-cent Water Conservation stamp may send addressed envelopes, together with remittance to cover the cost of the stamps to be affixed, to the Postmaster, Washington 13, D. C. A close-fitting enclosure of postal card thickness should be placed in each envelope and the flap either turned in or sealed. The outside wrapper should be endorsed "First Day Covers 4c Water Conservation Stamp." Orders must not include requests for uncanceled stamps.

1960 Pennsylvania Clean Streams Conference

The eighth annual Pennsylvania Clean Streams Conference, which will be held in Harrisburg, May 6, will feature as its topic the importance of good water supplies to industrial development and conservation progress in Pennsylvania.

The Conference is sponsored by the Pennsylvania State Chamber of Commerce in cooperation with some twenty other organizations and agencies. Among the speakers will be State Secretary of Commerce, William R. Davlin, who will discuss the economic development aspects of clean streams, and Dr. M. K. McKay of the State Sanitary Water Board which administers the clean streams laws.

Frank C. Amsbary, Jr., Dies

Mr. Frank C. Amsbary, Jr., Vice President, General Manager, and member of the Board of Directors of the Long Island Water Corporation, Lynbrook, N. Y., died January 31, at the age of 59.

He was author of many technical articles which appeared in Water and Sewage Works and in the Journal of the American Water Works Association. His distinguished career in the water utility field began in 1923 when he joined the then Champaign-Urbana Water Company (now Northern Illinois Water Company) as supervising engineer. Subsequently, he became Vice President of that organization until 1955 when he became affiliated with the Long Island Water Corporation.

A member of the A.W.W.A. since 1927, he became a life member in 1957 and an Honorary Member in 1959. He was the recipient of the Association's "Fuller Award" and served as president of the Association in 1956. Mr. Amsbary also was a member of the A.S.C.E, N.S.P.E., and the EJC.

No matter how insignificant the accident . . . .

Safety Costs Less

by GEORGE C. SOPP, Joint System Head & Asst. Mgr., Dept. of Water and Power, Los Angeles, Calif.

RESUME: What does safety cost? One thing is certain, the cost of prevention is far less than the price of an accident. Then, what do accidents cost? The immediate cost is real but the full impact of even the most minor accident is difficult to determine.

The business of safety involves human beings and the value of human misery and suffering is hard to calculate. But the elimination of such suffering and preventing of waste of valuable manpower and equipment are tangible rewards which will reflect on the financial record, the employee morale and the reputation of the utility. Accident prevention costs less; and in this area of increasing operating costs, a direct and continuous attack on the safety problem is one way to reduce expenditures.

■ MODERN FINANCING of water utility facilities requires a close look at operational costs. The industry is operating in an inflationary economy with rising costs of operation, rising costs of replacement and maintenance of equipment, and rising costs due to interest on money borrowed. In many cases these items have cut deeply into, or eliminated entirely, the profits of the company. Technological improvements will bring expenses down in some areas. Electronically supervised equipment just now coming into its own shows great promise in reducing operating expenses in the future.

There still exists one other major problem of importance to water utilities. This is the accident problem and here is one area where possibilities and opportunities still exist for effecting major economies. The accident problem has increased with, and sometimes surpassed, general growth and those attendant problems already mentioned.

Accident Costs

As water utilities grew and expanded in the early stages of development, there was an accident problem —but not much attention was paid to it because it merely represented a part of the cost of doing business. Yes, even at that early date in our history the accident problem existed, but with one major difference, there were few civil suits to collect damages and workmen's compensation insurance was unknown. Costs of accidents to the company were a minor factor and were accepted as an inescapable cost of operation, while human suffering went largely unrelieved and uncompensated. A workman suffering from a permanently disabling work injury was, in many cases, summarily terminated to become a burden on society and his community. If the workman was fortunate, he was relegated to the duty of gateman or night watchman, for rehabilitation programs were virtually unknown.

OFF-DUTY INJURIES, possibly by such improper use of tools, increase operating costs.

Today, accidents definitely are a major problem and according to the National Safety Council the cost to the Nation reached the astronomical sum of 12,100,000,000 dollars in 1958. This yearly national accident cost includes both on and off the job.

Water utilities are paying a large part of the cost of off-the-job injuries, directly in dollars, indirectly in reduced employee efficiency, or both. Business and industry have awakened to the realization that an off-the-job injury is a definite factor in the cost of operation.

The dollar costs of accidents penetrate into every phase of an organization's operation. Indeed, it is often the case that the true cost is almost impossible to uncover. For example, a "minor accident" occured when two aircraft contacted one another on the ground while taxiing. The repair bill was $193. Management knew there were hidden costs due to loss of revenue, idle equipment, "dead heading" of replacement aircraft, and shifting of passengers and crews. When the real cost was brought into the open, it was found to be nearly $19,000 instead of the modest $193. which was all that showed on the surface.

Nearly twelve billion dollars is a tremendous and needless price to pay for accidents, but this cost is only part of the picture because the greatest cost cannot be measured in mere dollars.

Everyone has probably seen the effect of the sickening impact and re-

sultant wreckage upon a home and family when a member of that family is seriously or fatally injured. These wounds and the many unmeasurable costs directly and indirectly connected with serious accidents affect every phase of community life. For instance, how many luxury items will a widow and her children buy from compensation payments?

Calculating Accident Costs

Accidents cut into an organization's efficiency to an extent often not realized. (Fig. 1) It is an unfortunate fact that management in many companies does not actually know the safety performance of its own organization, as compared with others in the same field.

As an example, Ajax Water Company has 100 employees. It experienced eight, lost-time injuries last year. This does not appear to be an excessive number and management may feel that no accident problem exists. Look at it another way. The safety performance of any organization can be closely calculated by using the frequency formula. When this is explored, it is often found that an apparently modest number of accidents actually reflect a greater frequency of accidents than the mining industry with its high degree of hazard from cave-ins and explosives, or the lumber industry which ranks with mining as one of the most hazardous occupations.

Accident frequency rates are calculated by multiplying the number of lost-time injuries by one million and dividing by the number of hours worked. This method is used because it can be applied to ten employees or ten thousand, and gives the number of injuries per million man hours of exposure.

If Ajax Water lost-time injuries are computed this way, it is found that the accident frequency is 39.84, a figure far above the hazardous occupations mentioned previously. Ajax Water Company has an accident problem, but is is hidden and goes unrecognized as such until the day a major accident awakens management to the seriousness of the problem; but unfortunately this may then have cost someone's life.

Source of Accidents

Why has the accident problem increased? Because of a great number of factors. Technological advances, though increasing production and making work easier, have often created new accident problems. Installations and modern facilities call for ever-increasingly heavier types of construction and equipment. Because of misuse, improper operation, and just plain thoughtlessness, many labor saving tools and appliances needlessly take a heavy toll of human life.

In the early days of the hand saw, it was unheard of for anyone to lose a finger or a hand. But today with the power-driven many "do it yourself" enthusiasts and professional craftsmen have lost fingers, limbs, and even their lives from this one tool which can do the work of ten men using hand saws, but it can and must be used safely.

The Safety Program

Launched from the Top

The question often arises at management meetings, "What can we do about our accident problems?" Unfortunately, there is no quick cure, no panacea that brings an immediate solution. This is the point where accident problems diverge from the normal operational problems of a water utility. In accident prevention you are primarily involved with human beings. There lies the difference. If a water distribution system needs improvement, an engineer designs the necessary changes and installations on paper and the objectives of the project are virtually assured—the top executive may give the project little or no attention because it is resolved satisfactorily at a lower level of supervision. Not so with a safety program, for to effect any noticable improvement, top management must devote considerable time not only in planning, but also by taking a position of active and vigorous leadership. Any improvement experienced in safety performance will be in direct proportion of effort exerted in this direction by management.

A safety program could be compared with one of the space rockets. Not only is it necessary to provide a commanding force and a tremendous initial thrust to get the rocket off the launching pad, but there must be timely and continuing thrusts provided to send it into outer space and achieve the objective. In getting a safety program under way, management must provide the thrust not only to launch the project but to sustain the program with its enthusiasm and active support.

The first step in safety is a series of meetings embracing all levels of management to plan and lay out a program which will be comprehensive and vigorous enough to achieve the results desired. Developing and training safe workers is an elusive thing not unlike morale. It is a condition that cannot be accomplished by a directive or order no matter how firm or well stated. This again is a point where accident prevention differs from usual water system problems.

PLANNING FOR SAFETY must come from the top. Management gives thought in planning (left). Supervisors execute plans by solving accidents in advance (center) and the Job Foreman applies principles and knowledge on the job (right).

Good morale is necessary among employees, but it cannot appear overnight in any company. It is something that is carefully developed and nurtured over the years, something that is planned and built into the philosophy and employee relations structure of the company.

Safety is the same in this respect because it too must be carefully, sometimes painfully, achieved after considerable effort and attention to detail by all levels of supervision. Safety and morale go hand in hand. An organization's safety performance is a primary index of employee morale, and often a good index of production and efficiency as well.

There are three major groups of accidents, and by examining each it may be more clearly seen how the twelve billion dollar National accident cost develops.

Equipment damage only

The first type of accident involves damages to equipment, structures, or materials, and is usually not grouped with or considered as an industrial accident because no one is injured. However, in most instances investigation will show that only a fortunate combination of circumstances prevented a personal injury. Repeated occurances will sooner or later result in injury. Too often the cost is considerable.

Employee injury only

The second type of accident is where injury to the employee is the only factor. Warehouseman may surfer a back injury from improper lifting—he is incapacitated for one day and incurs a cost to the company of $35. in medical expense and lost time. A laborer trips and falls into an excavation breaking his leg. The direct costs in this case for medical treatment and lost time amounts to $750. A pipe installer receives crushing injuries to his fingers and hand, when hoisting pipe. He is off duty for a five-day period and upon return he is assigned to light duty for three weeks. The cost of this accident is $190.

This dollar cost for lost time and medical treatment is not excessive, but this is not all. The hidden and indirect costs will boost the total even higher.

EQUIPMENT DAMAGE, no one hurt, but time and money wasted by needless accident.

Liability for accident

The third type of accident is one where the only injury or damage is to persons or property outside the company. An automobile in an accident may receive only a broken headlamp, the driver is unhurt; $1.80 will make the car as good as new. But look at it from another angle. There, in front of the car, lies a dead child, struck down in a crosswalk by the vehicle. The whole picture changes—try to set a price on a child's broken body. Carefully consider the cost in damages, cost to the parents in losing a child, and the cost of public confidence in the company.

Could the lack of safety instruction or training by management have resulted in an incident like this? Management and supervision, like the captain of a ship, must bear the burden of responsibility for the actions of others. If, by indifference or lack of interest on the part of management it fails to equip employees with the necessary training and instruction to carry out duties efficiently and safely, then management is shirking its duty to the company, the employees and to the community being served.

PERSONNEL INJURY when a boom collapses. This reenactment shows what happened when a helper took the wrong position to knock out fastening pins.

Combination Accidents

There can also be varying combinations of the three types of accidents that can have far-reaching effects on the operation and even financial success of a company. As an example, a few years ago an employee became caught in a large grinding and extruding machine in a plant engaged in the production of dry animal foods. The employee whose leg was mangled severely, was trapped and held in the hopper of the machine. In order to free the injured man it was necessary to actually destroy the machine by breaking away large pieces of casting with sledge hammers. The worker was released and after being hospitalized, he ultimately recovered.

The company itself, however, almost failed to recover from this single accident. The machine involved was not only beyond repair but replacement required several months' time. The damaged machine was the key to the entire production set-up, so the plant was shut down completely. The ensuing period of waiting with a large part of the overhead continuing almost resulted in financial failure. When production was finally resumed, many customers had gone over to competitors for their needs. This company felt the effects of this one accident for several years afterwards.

The examples given are not isolated or uncommon occurrences. The possibility of picking up any major newspaper for two days in a row without reading of a similar accident happening to someone is doubtful. It boils down to this—there is actually no practical limit to the cost of an accident.

The aforementioned accidents apparently all resulted from human failure. Eighty-five percent of all accidents are caused from human error. In the remaining 15 percent, there is a portion caused by unsafe conditions and unsafe equipment (which is the direct responsibility of management) which also serve as a contributing factor in a large portion of the 85 percent.

Fire is industrial accident

Fire prevention and protection of-

CREW SAFETY RECORD displayed on side of truck reflects achievement of the crew; serves as a reminder to them and a good public relations feature.

ten receive little attention in otherwise well-integrated safety programs. However, a fire is just as much an industrial accident as when a worker hurts his finger on a grinding wheel.

A few years ago, the management of a large manufacturing plant received warnings from the local fire department and the fire prevention engineers of their insurance carrier. Both agencies pointed out that great danger of fire existed because of improper handling of solvents and volatiles used during the manufacturing processes. The warnings went unheeded. Shortly afterwards a welder's torch started a small fire which quickly involved the entire plant. The fire and resulting explosions reduced the buildings to rubble, claimed seven lives and shut the plant down completely. Property loss alone amounted to over half a million dollars.

A successful safety program requires continuous training and education of all levels of supervision in order to reduce accident frequency and severity. Furthermore, if a company is to reach the ultimate goal of zero frequency, this will require the enlistment and active participation of every employee for the safety chain is no stronger than its weakest link.

A Functioning Program

The Water System of the Los Angeles Department of Water and Power has a very effective seven-point safety program which has functioned for a period of three years to bring about a definite and measurable increase in safety performance. Briefly, the program consists of:

1. Weekly trenchside or yard safety meetings. The procedure is to provide material pared by the Department or obtained from the various safety agencies pertaining to the work operations performed. The talks or subjects are presented by the foreman to his crew each week in meetings lasting from five to fifteen minutes.

These are not just "bull" sessions, but are carefully planned meetings using material designed to change attitudes and develop safety consciousness in every type of employees.

2. A policy of holding six management meetings yearly for discussion of the weekly meeting topics and to advise foremen on the most effective means of presentation.

3. An organized system of job instruction for new employees including adequate training in use of tools, equipment, proper lifting methods, the use of safety equipment and materials, and any other phase of safety pertinent to the work the new employees will encounter.

Proper instruction and insistence upon adherence to established rules in the Department Safety Manual help the new employee to realize the importance of safety and accept the responsibility to perform his work in a safe manner. The foreman is required to continue individual training of his new men in safe work practices for at least a six-month period.

4. The foreman is required to assemble his crew after an accident occurs, discuss with them the cause of the accident and how it could have been prevented.

Quick dissemination of accident information is in itself enough to prevent an immediate recurrence. Timely information concerning an accident is carried by supervision to all other crews performing similar work.

5. Establishment of safety committees composed of all levels of supervision whose duties are to investigate all major accidents and determine the preventive measures needed to initiate remedial action.

This is one of the best points in a safety program as it brings a greater number of supervisors into active participation. To neglect the investigative phase of the program is to leave the path wide open for recurrences of the same accident. If the company has already bought or is paying for one accident, why continue to pay for accidents of a like nature?

6. An eye-catching bulletin board is mounted on the side of each truck, showing man days worked without lost-time injury, and the figures are changed daily.

This is of tremendous value because this sign is a daily reminder to the crew of their safety achievement, and sharpens their interest in keeping the total growing. When an accident does happen, there is real disappointment at seeing the total return to zero. No small part of the effectiveness of this display is the public relations aspect which is obvious.

7. The award of a plaque to each crew working a year without lost-time injury.

These last two phases of the program promote employee interest in their safety program and their efforts are tangibly recognized by management in the presentation of the award.

Summary

What price safety? What price a human life? Characteristically, America has always placed a high value on a human life. During World War II, the cost of searching for and saving a downed pilot involved hundreds of thousands of dollars, in many instances. Recall some of the gallant rescues of men, women and children over the past years, instances where people were grasped from the very jaws of death without a thought for the expense involved. Industry has always unstintingly thrown valuable equipment and manpower into a rescue effort when needed, with no reward other than that of saving a life.

In spite of industrial mechanization and the advance of automation, the people of the water utility industry—the workers—are more important today than ever before because of their operating know-how and technical skill, as well as for the training which utilities have given them. It costs industry hard dollars when workers are not on the job.

What price safety? "The price of safety is eternal vigilance".

News of Suppliers

Hupp Corp. Acquires Manual Valve Operator Business

Hupp Corporation, Cleveland, Ohio, has acquired the manual valve operator business of the Jones Machinery Division, Hewitt-Robins, Inc. The purchase includes tooling, inventory and engineering designs, and Hupp has moved operations to its Hupp Aviation division in Chicago, and is now in production on all standard sizes.

The manual valve operator is considered to be a logical companion product for the Electrodyne automatic valve operator now produced by Hupp Aviation division. Its greatest market potential for the product, Hupp feels, will be in water works and sewage plants where manual valves or manual-electric valve combinations are used to operate butterfly valves.

Wesson Joins American Well Works

American Well Works, Aurora, Illinois, engineers and manufacturers of pumping, mixing, waste and water treatment equipment has announced that George A. Wesson, Jr. has joined the research, engineering and development staff.

Mr. Wesson comes to the American Well Works from the Permutit Company, with specialized experience as an application engineer. Prior to his work at Permutit, Wesson was a sanitary development engineer for the Dorr-Oliver Company.

Johns-Manville Buys Franklin Plastics

Johns-Manville Corp., New York, N. Y., has entered into an agreement for the purchase of Franklin Plastics, Inc., of Franklin, Pa., manufacturers and distributors of extruded plastic pipe. The purchase will provide Johns-Manville with a new product line of flexible, extruded thermoplastic pipe.

This type of pipe, originally used for jet well application, is beginning to be used in the irrigation field and by natural gas and water utilities for home service connections. It is also expected to find a future in an expanding market for plastic building sewer and drainage pipe.

Franklin Plastics has been operating in the extruded pipe field for the last six ears, producing and selling polyethylene, styrene and ABS plastic pipe. Its manufacturing facilities are located on a 1½-acre site, and the plant itself provides 26,000 square feet of operating space, with an annual production capacity valued in excess of $4,000,000.

Tex-Vit Inaugurates New Post for Chase

Texas Vitrified Pipe Co., Mineral Wells, Texas, has appointed David G. Chase to the position of Director-Sanitary Engineering. Previously, he has been Secretary-Manager of the Clay Pipe Institute, Los Angeles district, and before that, he was project engineer for the Willard-Brent Company, Los Angeles construction contractors, and District Engineer for the Rocky Mountain Area of the Clay Products Association.

A graduate of Michigan College of Mining and Technology, with a degree in civil engineering, Chase is affiliated with a number of water and sewage associations, including memberships in the American Public Works Association, Texas Water and Sewage Association, Arizona Sewage & Water Works Association, California Sewage and Industrial Wastes Association, Los Angeles City & County Engineers Association, and is an associate member of the American Society of Civil Engineers.

While announcing the appointment, the company stated that the creation of the new sanitary engineering post is a part of a program instituted sometime ago, which has been aimed at providing municipal officials, consulting engineers, and contractors with on-the-job assistance.

Dorr-Oliver Transfers Manufacturing Operations

Dorr-Oliver, Inc., Stamford, Conn., has announced that it is transferring all manufacturing operations from their Oakland, California manufacturing facilities to their Hazelton, Pennsylvania and Englewood, Colorado plants.

Since the merger of Oliver United Filters and the Dorr Company in 1955, the organization has spent more than $2,500,000 to modernize the Hazelton plant. West Coast customers will continue to be served from offices in Seattle, Washington; Oakland and Los Angeles, California.

Smith and Loveless Expansion Continues

Smith & Loveless, Division, Union Tank Car Company, Lenexa, Kansas, will begin construction this week on a $250,000 expansion program at the manufacturing plant near Lenexa, Kansas. The plant is located on old U.S. 50 near 96th Street.

The expansion will include a new 7,000-square-foot office building fronting on old U.S. 50 and a 50x200-foot addition to the front of the present manufacturing plant. Included in the expenditure is the acquisition of three acres to the south of the 10½ acre factory site, plus the construction costs on a new railroad siding to give access to the main line of the Frisco railroad which parallels old U.S. 50 at this point. The rail siding will facilitate the handling of carload shipments of steel and other materials, and the shipment of large sewage pumping stations and sewage treatment plant.

The plan represents the fourth major expansion of the factory since it was opened early in 1958, and closely follows the construction of a 12,000-square-foot production bay, completed last fall.

McQuade Rejoins Simplex Valve and Meter

Simplex Valve and Meter Company, division of Pfaudler Permutit Inc., Lancaster, Pa., announced today that Mr. R. A. McQuade has rejoined the Company as the Assistant to the General Manager.

Mr. McQuade was with Simplex Valve and Meter Company from

CONTINUED ON PAGE 98A

News of Suppliers

CONTINUED FROM PAGE 97A

1937 to 1955. During this period he was the Assistant Sales Manager, Assistant to the General Manager, and Assistant Secretary. When the Simplex Valve and Meter Company moved to Lancaster, Mr. McQuade was unable to leave Philadelphia and consequently severed relations with the Company.

In the interim, he was associated with the Burgess-Manning Company, Penn Instruments Division, where he was the Sales Manager.

Hooker Plans $10 Million Expansion at Niagara Falls

Hooker Chemical Corporation, Niagara Falls, N. Y., plans to invest about $10,000,000 in a new installation of Hoechst-Uhde, mercury type electraolytic cells at its Niagara Falls plant during the next two years. The purpose of the expansion is to increase production capacity of caustic soda, caustic potash chlorine and chemicals.

The cell installation is expected to be completed by late spring of 1961, soon after the first power is expected to be available from the nation's largest power development, the Niagara Project of the Power Authority of New York State.

The chlor-alkali installation marks the first phase of a four-step electrolytic cell expansion program at the Niagara plant of which the next two steps involve the installation of supplementary Hooker-type diaphragm cells; the fourth and last step being another mercury cell addition. Mercury cells were selected for the initial phase in order to produce caustic soda and caustic potash of extremely low salt content, preferable for some uses.

Swarthout Purchased By Crane

Crane Company, Chicago, Ill., recently announced that it had purchased the business and assets of the Swarthout Company, a Cleveland manufacturer of electronic controls. Swarthout will operate as a division of Crane Co. and will continue under the guidance of Kenyon and Charles Swarthout.

The acquisition is indicated as an important factor in Crane's advancement into the fields of automation and automatic valving. Swarthout is an original developer of fully-electronic, process control equipment and is a major producer of electronic control instrumentation for the power, gas, chemical, petroleum and nuclear industries.

Anderson Appointed Executive Vice President by Fairbanks-Morse

Fairbanks, Morse & Co., Chicago, Ill., recently announced that Gordon Rowen Anderson, noted engineer and inventor, who holds 25 patents in the electrical field, has been appointed Executive Vice President, in charge of Operations. Mr. Anderson has been with Fairbanks-Morse for 37 years.

The office is a new creation, and Mr. Anderson will have authority over divisional operations, including manufacturing, engineering and research.

He has just returned from Israel, as the engineer member of the negotiating team of Fairbanks-Morse and its parent organization, Fairbanks Whitney Corporation, for the agreement to erect two desalination plants. The plants will produce 500,000 gallons of fresh water a day from sea water.

The new Executive Vice President examined the equipment in the secretly-located desalination pilot plant in Israel which uses the process invented by Alexander Zarchin. This process, to which Fairbanks-Morse and the Israeli government have joint rights, converts sea water by a method of freezing, at a relatively low cost.

"Dick" Hager Joins Komline-Sanderson

Komline-Sanderson Engineering Corp., Peapack, N. J., has announced that W. R. "Dick" Hager has joined the company to work in Sanitary Engineering Sales.

Before joining Komline-Sanderson Dick was with Wallace & Tiernan, Inc., where his most recent assignment was Assistant Service Manager in Sanitary Sales. Previously, he had been employed by the Pennsylvania State Department of health for five years as a Sanitary Engineer in the Meadville District Office.

Dick received his B. S. in Civil Engineering at the University of Mississippi in 1949 and has done graduate work in Sanitary Engineering at Newark College of Engineering. He is a registered engineer in Pennsylvania and a member of the Pennsylvania S. I. W. A. and the New Jersey section of the A.W.W.A.

Bailey Meter Names Dodson Resident Engineer

Bailey Meter Company, Cleveland, Ohio, has announced the appointment of K. R. Dodson as resident engineer in Corpus Christi, Tex., subdivision of the company's Houston district. Dodson's address is 1009 Belmeade, Corpus Christi, Texas.

Dodson joined the company in 1952, and has been on the Houston staff since that time. He is a graduate of the U.S. Merchant Marine Academy with a major in marine engineering.

Heckman Joins B-I-F Sales Staff

B-I-F Industries, Inc., Providence, Rhode Island has announced that Mr. R. P. Heckman has been appointed Sales Engineer of the Boston Sales Staff. He joined the company in 1951 as a draftsman and for the past four years has served as an Industrial Applications Engineer for the company's extensive line of meters, feeders and controls.

In his new capacity as Sales Engineer, he will serve industrial customers in the New England area. His headquarters will be in B-I-F Industries Boston office, located in Islington, Mass.

Mr. Heckman graduated from

Brown University in 1950 and served in the U.S. Army Air Corps in the Pacific Campaign in the Philippines and Okinawa and at the time of his discharge held the rank of 1st Lt.

Preload Appoints Closner President

The Preload Company, Inc., New York, N. Y., has announced the appointment of J. J. Closner as President.

Mr. Closner has been with the Preload organization since 1949 serving in various capacities including Southwest District Manager, Assistant General Manager, and Vice President in Charge of Sales and Operations.

Work executed under Mr. Closner's management direction includes the prestressing of the approach spans of the Lower Tampa Bay Causeway—one of the first major prestressing jobs in the United States; the construction and prestressing of hundreds of prestressed concrete storage tanks; and the construction of the 300′ diameter dome over the Sports Palace in Havana.

Porter Elected Chairman of Board at Keasbey & Mattison

Keasbey & Mattison Co., Ambler, Pa., has announced the election of Robert R. Porter as chairman of the board.

In addition to his new duties, Mr. Porter will continue to serve as company president.

Joining Keasbey & Mattison in 1955, Mr. Porter was appointed executive vice president in March, 1956 and elected president in April 1957. Prior to this, he was vice president and sales manager of Ford Instrument Co., Long Island, N. Y., and, before this, he was associated with Cleveland Graphite Bronze Co. as a sales engineer.

Presstite Changes Official Name

Presstite Engineering Company of St. Louis, when purchased by the American-Marietta Company three years ago, was consolidated with American-Marietta's Keystone Asphalt Products Division and became known as Presstite-Keystone Engi-

CONTINUED ON PAGE 100A

YOUR CHOICE OF 3 TELEMETERING SYSTEMS

Remote Supervisory Controls designed and manufactured by Healy-Ruff Company are easy to apply—simple to use. Control only, or recording and indicating as well can be supplied. All systems incorporate these desirable features:

- Receiver can be any distance from transmitter
- Only one pair of wires is required
- 48 volt D.C. signal is used for lowest telephone line charges
- Heavy-duty mercury switches permit direct operation of motor starters

The RTM provides multi-circuit control, up to 8 circuits over one pair of wires, with single receiver. Transmitter can be pressure or float-operated. A D.C. signal in direct proportion to the pressure or level being sensed is transmitted, using proven time-impulse principle. Receiver can be furnished with recorder and indicator.
The Bi-trol controls two pumps over one pair of wires. First signal operates one pump—second signal operates other pump. An alternator can be supplied to equalize pump wear.
The Uni-trol controls a single pump. Type TAE is available with a return signal, to indicate the pump has started.

Write for Bulletins RTM and SC

HEALY-RUFF COMPANY
783 Hampden Avenue • St. Paul 14, Minn.
First in dependable controls for waterworks and sewage—since 1929
Remote supervisory controls • Complete system controls • Elevated tank controls • Sump controls • Hydropneumatic tank controls • Float controls • Alternators • Alarm silencers • Protective devices

PRATT®
Monoflange Mark -II
the versatile valve

the ideal valve for many waterworks applications in the 0-150 psi pressure range. Sizes 4" thru 20". Manual, cylinder, electric motor and diaphragm actuators.

For complete description, fluid and gas flow data, operator sizing, and prices, write for Bulletin 10-B.

HENRY PRATT®
THE HENRY PRATT COMPANY
319 WEST VAN BUREN ST.
CHICAGO 7, ILLINOIS
Representatives in Principal Cities

News of Suppliers

CONTINUED FROM PAGE 99A

neering Products Company, Division of American-Marietta Company.

The name has now been officially changed, it has been revealed by Cyril H. Smith, President and General Manager of the company, and the company will henceforth be known as the Presstite Division, American-Marietta Company.

Barrett Promoted by Buffalo Meter Corporation

Buffalo Meter Company, Buffalo, N. Y., recently announced the promotion of Herbert F. Barrett to General Sales Manager. He has been Sales Manager since 1930 and, in his new capacity, will be responsible for the industrial division for sales of the Niagara liquid meters and the water meter division for sales of American water meters.

Buffalo Meter Company has operated as a wholly owned subsidiary of the American Meter Company of Philadelphia since 1958.

Smith & Loveless Appoint Huntress to District Sales

Smith & Loveless, Inc., Lenexa, Kansas has announced the appointment of Charles O. Huntress as a district sales manager. Mr. Huntress is well known in water and sewerage circles in the Middle West and has an excellent background for his new position.

Mr. Huntress was formerly with Phillips Petroleum Co. in production and research, was a sales manager with Infilco, Inc. and was superintendent of public utilities and city manager of Bartlesville, Oklahoma. He joined the company from Municipal Service Co. in Kansas City where he was active in sales, engineering design and project managing.

At Smith & Loveless, Mr. Huntress will work directly with Smith & Loveless representatives on special projects or whenever a factory representative is required. He and his family reside in Prairie Village, Kansas.

Eimco Appoints Division Vice-Presidents

The Eimco Corp., Salt Lake City, Utah, has announced the election of Jack W. Pratt and Berne A. Schepman as vice-presidents of Process Engineers Division.

Mr. Pratt, Eastern Sales Manager of the Process Sanitary Division, has been with the company for 13 years, and is located at the Eimco Process Research and Development Center, Palatine, Illinois.

Mr. Schepman is located in the sales and engineering offices of the Process Division in San Mateo, California, and has been with the organization since 1953.

Pennsalt Builds New Atlanta Plant

Pennsalt Chemicals Corporation, Philadelphia, Pa., has scheduled the construction of a blending, packaging and warehousing plant at Atlanta, Ga., this coming Spring. This new facility will represent an investment of $500,000 and is the seventh unit built by Pennsalt in the past five years.

The building will be constructed on a ten acre site served by a direct rail spur and an express highway. It will be a modern, one-story structure and was located in order to provide fast service to area customers.

Bell and Gossett Acquires Colorado Research

Bell and Gossett Company, Morton Grove, Ill., has purchased the Colorado Research Corporation, formerly a subsidiary of the Carrier Corporation.

Colorado Research Corp., is a leading firm in the development of new electronic devices for government and industry. The addition of their products and facilities to Bell and Gossett's existing line of electronic items is expected to enable B & G to advance more rapidly in this field.

Burnette Gets Rockwell Post

Rockwell Manufacturing Co., Pittsburgh, Pa., announced the appointment of Raymond V. Burnette as Midwestern engineering manager of their new Water and Sewage Valve Sales Unit of the company's Meter and Valve Division.

Mr Burnette's primary responsibilities will be to contact consulting engineers and municipalities and discuss Rockwell products for the water and sewage fields. He will cover the middle-west between the Applachian and Rockies, and from Canada to Texas.

Since 1955, he has been Chicago District sales manager. In 1949, he was named gas sales supervisor for the Central region. He is a member of the Illinois Society of Professional Engineers, and will make his headquarters in the Chicago Meter and Valve office.

Permutit Opens Canadian Service

Permutit Division of Pfaudler Permutit, Inc., New York, N. Y., has established a chemical service department at Permutit Company, of Canada Ltd., with offices in Toronto, Montreal and Calgary. The new department will supply chemicals and chemical specialties to industrial users throughout the dominion.

Permutit also announced that John Irwin has been named head of the engineering sales staff of the new department. In the past seven years, Mr. Irwin has covered most of the provinces as a sales and service engineer specializing in chemical water treatment products.

The new chemical department's opening coincided with the opening of the Canadian Power Show where the company's products were displayed. Among the items to be supplied by the new department are chemicals for treatment of boiler-feed water and circulating cooling water systems, coagulant aids, corrosion inhibitors, anti-foam additives, combustion chemicals, fuel oil stabilizers, neutralizing and filming amines, dispersants and ion exchange resins.

Meetings

1960

JANUARY						
S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

FEBRUARY						
S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29					

MARCH						
S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

APRIL						
S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

MAY						
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

JUNE						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

Mar. 14-18—Dallas, Texas (*Memorial Auditorium*) Annual Convention NATIONAL ASSOCIATION OF CORROSION ENGINEERS.

Mar. 16-18—Chicago, Ill. (*Pick-Congress Hotel*) ILLINOIS SECTION, A.W.W.A. Secy: D. W. Johnson, Research Engr. Cast Iron Pipe Research Assn., 3440 Prudential Plaza, Chicago 1.

Mar. 16-18—Baton Rouge, La. (*La. State University*) Short Course for Superintendents and Operators of Water and Sewerage Systems. Fred H. Fenn, Dean, College of Engineering.

Mar. 17—Boston, Mass. (*Statler Hotel*) NEW ENGLAND SECTION, A.W.W.A. Secy: R. M. Soule Assoc. Sanit. Engr. State Dept. of Public Health, 511 State House, Boston.

Mar. 20-23— Savannah, Ga. (*DeSoto Hotel*) SOUTHEASTERN SECTION, A.W.W.A. Secy: N. M. de Jarnette, Engr. Water Quality Div., State Dept. of Public Health, 309 State Office Bldg., Atlanta.

Mar. 23-24—Huntington, W. Va. (*Hotel Pritchard*) WEST VIRGINIA SEWAGE AND INDUSTRIAL WASTES ASSN., Secy-Treas: Glen O. Fortney, St. Dept. of Health, Charleston 5, W. Va.

Mar. 24-25—Huntington, W. Va. (*Hotel Pritchard*) WEST VIRGINIA SECTION A.W.W.A. Secy: H. W. Hetzer, Engr., Union Carbide Chem. Co., Box 8361 South Charleston.

Mar. 29—Atlantic City, N. J. (*Hotel Traymore*) JOINT GASEOUS-LIQUID INDUSTRIAL WASTES CONFER. Eastern Air Pollution Control Assn. Secy: A. T. Leahey, P. O. Box 32, W. Trenton, N. J.

Mar. 30, April 1—Atlantic City, N. J. (*Hotel Traymore*) NEW JERSEY SEWAGE & INDUSTRIAL WASTES ASSN. Secy: A. T. Leahey, P. O. Box 32, W. Trenton, N. J.

Apr. 3-8— New York City, N. Y. (*Coliseum*) 6TH NUCLEAR CONGRESS sponsored by EJC and other engineering and scientific societies including A.W.W.A.

SEND FOR FREE

CHLORINE MANUAL

Get 76 pages of useful, quickly digested facts on chlorine.

Bulletin 125 is a de luxe, stiff-covered, soil-resistant manual, organized for easy reference. It . . .

- Lists physical properties with helpful charts and graphs.
- Tells how to handle chlorine safely.
- Describes and illustrates equipment.
- Describes standard containers.
- Tells how chlorine is made. Gives history of famous Hooker S cells.
- Lists many services available from Hooker.

Please send free copy of Bulletin 125 to:

Name and title .....

Company .....

Address .....

HOOKER CHEMICAL CORPORATION

1701 UNION STREET, NIAGARA FALLS, N. Y.

Sales Offices: Chicago, Detroit, Tacoma, Los Angeles, New York, Niagara Falls, Philadelphia, Worcester, Mass.

HOOKER CHEMICALS PLASTICS

In Canada: Hooker Chemicals Ltd., N. Vancouver, B.C.

Apr. 5-7—Binghamton, N. Y. (*Sheraton-Binghamton Hotel*) NEW YORK SECTION, A.W.W.A., Secy: Kimball Blanchard, N. Y. Branch Sales Off., Neptune Meter Co., 2222 Jackson Ave., Long Island City.

Apr. 5-14—Cleveland, O. (*Hotel Netherland-Hilton*) NATIONAL MEETING—AMER. CHEM. SOCIETY DIV. OF WATER & SAN. CHEMISTRY Symposium on Indust. Wastes in conjunctn. with 137th Meeting., Prof. C. Fred Gurnham Head of Dept. of Chem. Engrg., Michigan State Univ., E. Lansing.

Apr. 6—University of Missouri, Columbia, Missouri. JOINT CONFERENCE MISSOURI SECTION A.W.W.A. and University of Missouri, on Water Softening and Stabilization of Softened Water. Secy: Dr. Warren Kramer, Missouri Division of Health, Jefferson City, Missouri

Apr. 7-8—Raleigh, N. C. (*State College Campus*) 9TH ANNUAL MUNICIPAL & INDUST. WASTE CONFER. Write: The Div. of College Extn., P. O. Box 5125 State College Sta., Raleigh, N. C.

Apr. 20-22—New York, N. Y. (*Manhattan College*) THIRD BIOLOGICAL WASTE TREATMENT CONFER. Write: W. Wesley Eckenfelder, Assoc. Prof. Manhattan College, New York 71.

Apr. 20-22—Lincoln, Neb. (*Cornhusker Hotel*) NEBRASKA SECTION, A.W.W.A., Secy: J. J. Rossbach Jr., Civ. Engr. Metropolitan Utilities Dist. 3906 N. 48th St., Omaha.

Apr. 20-22—Emporia, Kan. (*Broadview Hotel*) KANSAS SECTION, A.W.W.A., Secy: H. W. Badley, Repr., Neptune Meter Co. 119 W. Cloud, Salina.

Apr. 22—Monterey Cal. (*Mark Thomas Inn*) CALIFORNIA SECTION, A.W.W.A., Secy: R. E. Dodson, Jr., Supt. of Water Dept. of Utilities, Balboa Pk., San Diego.

Apr. 24-27—Buffalo, N. Y. (*Statler Hotel*) CANADIAN SECTION A.W.W.A., Secy: A. E. Berry, 72, Grenville St., Toronto, Ont.

Apr. 27-30—Berkeley, Calif. (*Claremont Hotel*) Calif. SEWAGE AND INDUSTRIAL WASTES ASSN. Write A. D. Leipzig, Secy.-Treas., c/o Hyperion Sewage Treatment Plant, 1200 Vista Del Mar, Venice, Calif.

Apr. 28-30—Tucson, Arizona (*Pioneer Hotel*) ARIZONA SECTION, A.W.W.A., Secy: A. D. Cox Jr. Secy. & Comptroller, Arizona Water Co., Box 5347, Phoenix

Apr. 28-30—Billings, Mont. (*Northern Hotel*) MONTANA SECTION, A.W.W.A., Secy: A. W. Clarkson, Asst. Dir., Div. of Envirn. Sanit. State Board of Health, Helena.

Apr. 28-30—Billings Mont. (*Northern Hotel*) MONTANA SEWAGE & INDUST. WASTES ASSN. Secy-Treas: A. W. Clarkson, Div. of Envirn. Sanit., State Brd. of Health, Helena

May 3-5—Lafayette, Indiana. (*Purdue Memorial Union Bldg.*) 15th PURDUE INDUSTRIAL WASTES CONFER.

May 4-6—Portland, Ore. (*Benson Hotel*) PACIFIC NORTHWEST SECTION, A.W.W.A., Secy: F. D. Jones, W. 2108 Maxwell Ave., Spokane 11, Wash.

Synchro-Start
FULL AUTOMATIC
ENGINE
CONTROLS
FOR GASOLINE DIESEL & GAS ENGINES

Synchro-Start's new protective engine controls have been designed, for the starting and stopping of engines from remote pilot devices, such as pressure switches, float switches, power failure relays, etc., and are completely automatic in operation.

These dependable controls are encased in a steel, dust proof cabinet, and now feature enclosed PLUG-IN RELAYS as well as OVERLOAD BREAKERS. The plug-in relays simplify what little field maintenance that may have been required in older models, while the overload breakers eliminate the necessity of replacing fuses.

In designing this unit we have used the same high quality materials and workmanship that our customers have come to expect throughout Synchro-Start's 27 years of manufacturing engine controls.

SYNCHRO-START PRODUCTS, INC.
Since 1932
8151 NORTH RIDGEWAY AVENUE • SKOKIE, ILLINOIS

CALIFORNIA'S
welcome
to the world

SANTA MONICA'S
Miramar
and NEW TOWER

California's World Famous Resort overlooking the Blue Pacific where Wilshire meets the sea. Twenty minutes from International Airport. 450 luxurious rooms and bungalows, all with television and radio. Complete convention facilities. Banquet rooms for up to 2,000, air-conditioned. Exciting new Venetian Room and Cantonese Room. Swimming pool . . . Beautiful grounds and landscaped gardens. Rates from $8. Write William W. Donnelly, Gen. Mgr.

Across the U.S.A. and in HAWAII
MASSAGLIA
CREST OF GOOD LIVING
JOSEPH MASSAGLIA, JR., President

Santa Monica, Calif. Hotel MIRAMAR
San Jose, Calif. Hotel SAINTE CLAIRE
Long Beach, Calif. Hotel WILTON
Gallup, N. M. Hotel EL RANCHO
Albuquerque, N. M. Hotel FRANCISCAN
Honolulu Hotel WAIKIKI BILTMORE
New York City Hotel NEW YORKER
Washington, D. C. Hotel RALEIGH
Hartford, Conn. Hotel BOND
Pittsburgh, Pa. Hotel SHERWYN
Cincinnati, O. Hotel SINTON
Denver, Col. Hotel PARK LANE

CHICAGO MIDWEST HEADQUARTERS
BOOKING OFFICE 200 E. WALTON DE 7-6344
World famed hotels—Teletype service—Television

New Bulletins

AVAILABLE FREE

Rotameters and Flow Indicators Listed

318

Schutte and Koerting Company, Cornwells Heights, Bucks Co., Pa., has recently issued its condensed bulletin, M-1, that illustrates and briefly describes their Instrument Division's line of precision instruments for measuring, indicating, recording, and controlling the rate of flow of all types of fluids.

The bulletin includes information on: Rotameters, including general purpose, glass-tube types, armored types, by-pass and "T" types, transmitting types, alarm types and small purge units for applications where an inexpensive type is applicable; Flow Indicators, designed for installation in pipe lines where it is necessary to determine, by visual observation, that the fluid is flowing in the right direction and in the proper state and condition.

Transistorized Pipe Detector

319

Computer-Measurements Company, Sylmar, Calif., announces the availability of literature describing its new "808" pipe detector which features a circuitry specifically developed for use with transistors. The unit is designed to perform under all operating conditions, including all variations of temperature.

Among the other features covered by the literature are an automatic switching device for direct connection, shielded printed circuits, the separate oscillator system, and the built-in battery testers.

New Fire Hydrants

320

A. P. Smith Manufacturing Co., East Orange, N. J., has just issued a 20-page manual explaining the operation, construction, and maintenance of their new Model H100 fire hydrant.

Containing detailed cutaways, photographs, and mechanical drawings, the manual provides easy-to-read graphic illustrations of the various construction features, and the procedures for the installation, inspection, maintenance and repair of the equipment as well.

Other items included in this particularly informative manual are details for optional constructions and the specifications required for ordering.

Instrument Catalog

321

The Hays Corporation, Michigan City, Indiana, has just published a new eight-page illustrated condensed instrument catalog.

The condensed version is divided into seven sections for convenience of the user. Sections 2 through 6 list Hays instruments according to the five major process variables—pressure, flow, temperature, level, and gas analysis. Section 7 lists Hays Receivers including the new Universal Electronic Recorder.

In every section, the new bulletin gives a complete description and specifications of each product listed.

Electronic Solution Controller

322

Electro Mechanisms Corporation, Skokie, Ill., has announced the availability of a 4-page bulletin that decribes their new electronic solution controller.

The literature discusses and illustrates various features of the equipment, its operation and application, including such topics as the automatic control of concentration of caustic, acidic or aqueous solutions in either continuous or batch-type chemical and other process systems. Individual components of the unit are described including the sensing electrode, magnetic amplifier, pump assembly, wash tank and the holding tank.

Valve For Abrasive Slurries

323

United Conveyor Corporation, Chicago, Ill., has announced the release of literature describing its newly developed valve for abrasive slurry applications. The new product can be installed in any position and has no slots or guides to interfere with valve movement.

Illustrating the unit are dimensional and operational diagrams and a photograph showing it installed.

Electric Power Drives

324

Sterling Electric Motors, Los Angeles, California, has expanded and revised its Catalog #258 covering electric power drives. The 68-page publication includes more than 8000 ratings, and has a simplified numbering system that aids in the quick and easy selection of suitable units.

Other features of the catalog are the dimensions and modifications for squirrel cage motors, gearmotors, speed reducers, right angle gearmotors, right angle variable speed drives and variable speed drives. The ratings listed are from ¼ to 200 horsepower, and the variable speed drives range from 4660 rpm down to 0.2 rpm in variations from 2:1 to 10:1.

Hose and Hose Fittings Catalog

325

Lenz Company, Dayton, Ohio, has announced the publication of an 8-page, illustrated catalog describing the company's line of industrial hose and hose fittings. Included among the listed items are re-usable hose fittings, assemblies, adapters, and single and double wire braid hose. These are designed for high, medium and low pressures in universal plant and industrial applications.

The catalog is divided into eight sections: sections one through three cover single wire braid hose construction and specifications, single wire braid hose fittings, and single wire braid medium pressure hose assemblies; sections four through six discuss double wire braid hose construction and specifications, double wire braid hose fittings, and double wire braid high pressure hose assemblies; and the final two sections describe hose adapters and swivels, and single wire stripped cover hose and fittings.

All sections include diagrammed assembly instructions.

Two-Stage High Head Canned Pump

326

Chempump Division, Fostoria Corp., Huntingdon Valley, Pa., has issued a 4-page bulletin that illustrates and describes its new series of two-stage, high head, "canned" pumps

CONTINUED ON PAGE 104A

GUNITE does it 2 times as fast at 1/2 the cost

"Gunite" is the modern process (sand and cement applied pneumatically) for repairing, constructing, lining:

- Reservoirs
- Dams
- Filter Plants
- Sewage Disposal Plants
- Tanks
- Stadiums
- Bridges
- Sea Walls
- Swimming Pools, etc.

WRITE FOR MORE INFORMATION, INCLUDING 48 PAGE "GUNITE" BOOKLET.

PRESSURE Concrete Co.

FLORENCE, ALA. 1555 Helton Street

OTHER OFFICES IN

CHICAGO, ILL. 30 W. Washington Street

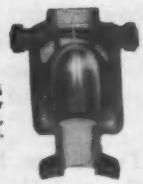
NEWARK 5, N. J. 193 Emmet Street

Crispin AIR VALVES

...keep pipelines open for safe, economical operation

Simplified construction, easy accessibility, maximum durability and efficient cost-saving operation are basic in every Crispin Air Valve.

Crispin UNIVERSAL AIR VALVES ... positive, full-time air control when line is filled, in operation or emptied.



Crispin AIR & VACUUM VALVES ... permit air to escape as line fills, allow air to enter as line empties.

Crispin PRESSURE AIR VALVES ... provide automatic air escape while line is under pressure; prevent air accumulation in line.

AIR CONTROL VALVES • FOR OVER 45 YEARS

multiplex MANUFACTURING COMPANY

BERWICK, PENNSYLVANIA

Dept. B

Write, wire or phone for complete information on dependable Crispin Air Valves that keep your pipelines open for safe, economical operation.

New Bulletins

CONTINUED FROM PAGE 103A

that are especially designed for high pressure applications.

The bulletin contains the overall dimensional and operational data of these pumps, and a cross-sectional cutaway gives a graphic presentation of its main features. The unit will operate against heads to 600 feet, at temperatures to 850° F., and pressures to 3500 psi.

Water, Sewage & Industrial Waste Treatment Equipment

327

The Jeffrey Manufacturing Company, Columbus, Ohio, has just released a catalog on Jeffrey Equipment for Water, Sewage and Industrial Waste Treatment.

"The Mountain Boys"

328

United States Pipe and Foundry Co., Birmingham, Ala., has available an attractive 2-color booklet reprinting the series of "Mountain Boys" cartoons and captions, that have been used for illustrating the company's recent series of advertisements, emphasizing Tyton Joint Pipe.

Air-Stream Pollution Seminar Proceedings

329

American Cyanamid Co., New York, N. Y., has published the papers delivered at the air-stream pollution control seminar held in connection with the dedication last year of the company's $4,500,00 waste treatment facility at Bound Brook, N. J.

Dissolved Oxygen Meter

330

The Hays Corporation, Michigan City, Ind., has just released three specification sheets giving complete description and details of operation of the three basic units which make up the new Hays Dissolved Oxygen Meter.

Heat Exchanger Catalog

331

Young Radiator Company, Racine, Wisconsin, has announced the re-

lease of a 15-page newly revised Shell and Tube Heat Exchanger catalog which presents the complete data on their copper base alloy, steel and stainless steel fixed tube, bundle heat exchangers.

The catalog lists tables showing pressure ratings and material specifications for steam service exchangers. The construction features, model identification, and a six-step set of instructions explain the selection of the appropriate unit. Also included is an oil viscosity graph, a table of weight and dimensions and numerous photographs showing on-the-job installations of the equipment.

Filter Designed for Acid Pump Efficiency

332

Milton Roy Company, Philadelphia, Pa., is offering its 2-page bulletin that describes the company's especially designed sludge trap and filter, which traps and removes concentrated sulfuric acid sludge, thus allowing controlled volume pumps to work at maximum efficiency.

A cutaway drawing of the trap and filter, and an operational diagram of its possible installation illustrate the unit's main features.

Stainless Steel Filters

333

Micro Metallic Division, Pall Corporation, Glen Cove, N. Y., has available new, revised literature describing their line of porous, stainless steel filters. The 4-page bulletin porvides information on the properties of porous stainless steel, and presents the full specifications of the standard filters made by the company, as well as a number of new sizes and types.

Photographs and descriptions of some types of custom designed filters are featured; detailed technical data are included to permit a direct ordering of stock units.

Automatic Control of Water Treatment Plants

334

Graver Water Conditioning Co., New York, N. Y., has issued its Technical Reprint T-179, which is entitled, "Instrumentation for Water Treatment Plants", and is divided into two parts.

Part I discusses the control of demineralization plants and covers such subjects as "stepless" regeneration, quality control of effluent, conductivity and pH control. Part II considers control of cold process softening and clarification units, hot process-hot zeolite systems and sodium zeolite systems.

This last article also includes a review of panelboards, and recent developments in the field of control including silica recorders, monitors, solid state controls and the company's new, automatic tape analyzer. Diagrams and photographs illustrate various points discussed in the text.

Concentric and Flat Leaf Vacuum Filters

335

Proportioneers Division, B-I-F Industries, Inc., Providence, R. I., have issued a new bulletin that presents information regarding their two vacuum filter styles designed for the efficient filtration of municipal and industrial potable water supplies, and of commercial, institutional and municipal swimming pools.

The filters are Model VFL with flat leaf filter elements, and Model VFC with concentric leaf filter elements. Both types are made entirely of heavy duty, corrosion-resistant materials, and both feature open-tank construction for visible operation and top-take-off.

Photographs, cutaways, dimensional drawings, capacity charts and other descriptive information are provided in the bulletin. Job applications are also listed, and the bulletin contains an operational flow diagram.

Halogen Leak Detectors

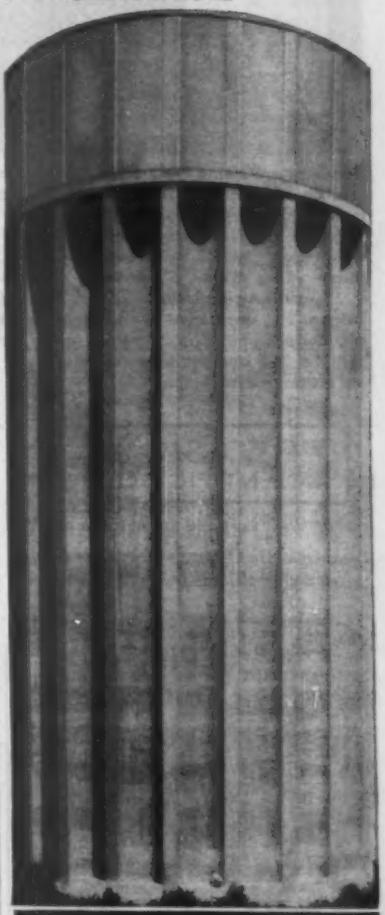
336

General Electric Company, Schenectady, N. Y., has published a 6-page bulletin that furnishes detailed information on the use of halogen leak detectors for finding leaks in enclosures that can be pressurized.

Among the applications discussed in the bulletins are hydraulic systems, steam boilers, valves, piping, transformers, air conditioning and refrigeration equipment. Included in the discussions are such topics as system preparation, testing procedures, quantitative measurement techniques and calibration.

CONTINUED ON PAGE 106A

MORE THAN 2000 PRESTRESSED CONCRETE TANKS IN SERVICE



Look at these features:
- Minimum maintenance
- 75% construction cost spent locally
- Satisfied owners
- Longest service life of any tank
- Lowest overall cost

Send for Bulletin T-22

PRELOAD

THE PRELOAD COMPANY, INC.
211 East 37th St., New York 16, N. Y.
351 Jefferson, Dallas, Texas

PRELOAD CONCRETE STRUCTURES INC.
837 Old Country Road
Westbury, Long Island, New York

HERRICK IRON WORKS
28400 Clawiter Road
Hayward, California

THE CANADA GUNITE COMPANY, LTD.
125 Hymus Blvd.
Pointe Claire P Q Canada

Temperature range from 5° to 50°C with overall temperature uniformity meeting rigid APHA specs . . . more than a BOD cabinet . . . versatile enough for drug storage, serum studies, dairy product testing, many more tasks . . . external controls . . . forced air circulation . . . unobstructed interior . . . increased working space at NO increase in price . . . write today for Bulletin 303 and the name of your nearest stocking distributor.

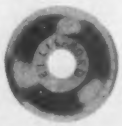
SINCE 1920

PRECISION SCIENTIFIC CO. PS

3737 West Cortland St., Chicago 47, Ill.

Local Offices in Chicago • Cleveland • Houston
New York • Philadelphia • San Francisco

Ellis Heavy Duty Pipe Cutters For Pipe Up To 16" Dia.



With Long Lasting Cutter Wheels

Designed for water works men who appreciate the rugged construction of drop-forged frame and links; and a tool that assures no pipe breakage, no re-cutting and no spoilage.

THREE SIZES

No. 01 for 4" to 8" Pipe
No. 1 for 4" to 12" Pipe
No. 1B for 4" to 16" Pipe

write today for free literature

ELLIS & FORD MFG. CO.
1100 COOLIDGE RD.
BIRMINGHAM, MICH.

New Bulletins

CONTINUED FROM PAGE 105A

Subdrainage Pipe with Positive Lock Seam

337

Republic Steel Corporation, Cleveland, Ohio, is offering literature announcing and describing its new, LOK-COR subdrainage pipe that incorporates a positive lock seam and helical corrugations to give the pipe strength and the flexibility to withstand heavy loads.

The literature contains an illustration of the pipe and a combined dimension and weight chart by which the size of the pipe may be determined for appropriate applications.

Booklet Describes System of Property Control

338

Metalcraft, Inc., Mason City, Iowa, is offering a 16-page booklet that explains its five-step plan for organizing a property control system and putting it into action. The comprehensive treatment of this problem is called, "How to Plan a Profitable Property Control Program".

The main parts of their recommended plan include the use of property tags bearing company or plant identification and a serial number that must be affixed to all machines, plant equipment, fixtures and office furniture. These are used in conjunction with individual record cards, illustrated in the booklet, for recording pertinent data about each individual asset.

Not only descriptive literature, but a "try before you buy" kit of serially numbered "Autographs", the adhesive-back, aluminum property tags, will be furnished with the booklet.

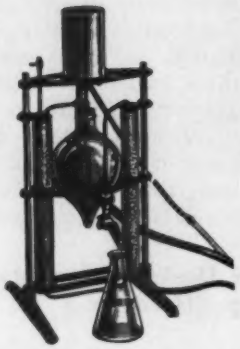
Rubber Seated Butterfly Valves

339

Darling Valve and Manufacturing Co., Williamsport, Pa., has recently issued a comprehensive, 36-page catalog containing detailed information the Darling-Pelton valves. These units are designed in accordance with A.W.W.A. specifications and for hydrostatic operating pres-

ENSLOW

STABILITY INDICATOR



For checking the equilibrium of a finished water, and supplying an index useful in controlling anti-corrosion treatment. Catalog No. 83-895

WRITE:

Phipps & Bird, Inc.
P. O. Box 2V Richmond 5, Va.

DOING ONE THING AND ONE THING WELL—

FOR OVER 60 YEARS!

ROBERTS FILTER
MANUFACTURING CO.

•

DEPENDABLE MODERN
WATER PURIFICATION EQUIPMENT
CALL OR WRITE

MECHANICAL EQUIPMENT BY ROBERTS FILTER MFG. CO. DARBY, PENNA.

New Bulletins

sures to 125 psi and velocities to 16 feet per second.

The information provided in the catalog includes data on the construction and design of the valves, dimensions, directions for ordering, general hydraulic data, application and methods of operation. Charts, diagrams, cutaways and photographs illustrate various points covered by the descriptions.

Electric Operators for Double Seal Ball Valves

340

Jamesbury Corporation, Worcester, Mass., have recently issued a product data sheet that describes their electric motor operators designed for use with all Jamesbury "double seal", ball valves in the ¼ to 4 inch size range.

The operators are of weather and vapor proof design and can be manually operated in case of power failure. They have planetary gearing and a life expectancy in excess of 500,000 cycles.

Included in the data sheet are drawings and the dimensions for two sizes of motor operators to fit all of the company's valves. Also shown is a wiring diagram, and a chart that indicates temperature characteristics.

Gate Valve Has Nylon Discs

341

OPW-Jordan Corporation, Cincinnati, Ohio, have announced the publication of a new bulletin describing their exclusive nylon discs used as seats for their No. 76 gate valve. The construction of these valves is illustrated by various diagrams, and the bulletin also gives engineering information and specifications.

An additional release, Chemical Recommendation Chart #76, is also available. This chart lists a number of chemicals and their suitability for use with the valves.

High Color-Low Turbidity Water Discussed

342

Graver Water Conditioning Co., New York, N. Y., has published and made available a new, technical reprint which discusses in detail the clarification of high, color-low turbidity waters. The 7-page booklet is primarily concerned with design considerations and operating experiences encountered in handling this problem.

Among the topics discussed in the paper are, the chemical treatments suitable for removing the condition, and the design and operating factors that must be considered to determine an adequate clarification unit to handle the specific problem at hand.

Four case histories are discussed to show examples of successful clarification of high, color-low turbidity waters, and photographs of the plants discussed are included. The booklet also provides operational tables, performance curves, flow diagrams, and equipment illustrations.

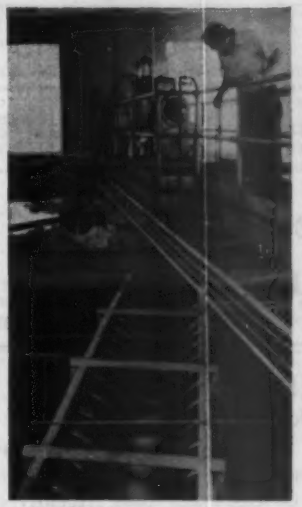
Electronic Batch Controls

343

C. S. Johnson Company, Champaign, Ill., has recently published an 8-page catalog describing Johnson Electronic Controls designed for accurate, remote-control batching.

The catalog explains how an operator is able to set these controls for the automatic batching of ½ to 6 cubic yards of various types of preset mixes, then be able to follow the batching process by means of the signal lights on his control panel.

In addition, the catalog contains photographs and drawings that illustrate the construction and installation of the various controls. The descriptions include operational information, and each section of the catalog is classified by job application.



Consolidated Water Power & Paper Co.

Raw water color plunged from 90 ppm to 4 using N-Sol COAGULANT AID

"Continuous application of N-Sol*, activated silica sol, enables a heavier floc to settle into the slurry pool and hopper. Without silica sol coagulant aid, settling time would be doubled and filter water wouldn't be clean" . . . Paper Mill Supt.

Water plants, industrial as well as municipal, throughout the country are experiencing economies and improved finished product because of the addition of activated silica sol in the water conditioning or treatment system.

Write for samples of "N" silicate and reactant to determine specific benefits. Jar test instructions are included.

**Prepared with our "N" sodium silicate (41°Be at 68°F., 8.9% Na_2O, 28.7% SiO_2) and reacting chemical at point of application.*

PQ SOLUBLE SILICATES

Trademarks Reg. U.S. Pat. Off.

PHILADELPHIA QUARTZ CO.
1166 Public Ledger Bldg., Philadelphia 6, Pa.

Associates: Philadelphia Quartz Co. of Calif., Berkeley & Los Angeles, Calif.; Tacoma, Wash.; National Silicates Limited, Toronto & Valleyfield, Canada

VALVE OPERATION

DEAN TRUCK MOUNTED VALVE OPERATOR

MAKES EVERY VALVE POWER OPERATED

PAYNE DEAN & CO. CLINTON, CONN.

CHEMIST

Chemical Engineer
Mechanical Engineer

Research and development opportunities for men who have at least 3 years of experience in water conditioning or Ion exchange process.
Supervisory responsibilities available to qualified applicants. Professional recognition, excellent salary and employee program including profit sharing with the world's leading manufacturer of water conditioning products. Apply in confidence, submitting a detailed resume of your experience, salary desired and recent photograph.

F. T. MOHR
Culligan, Inc.
NORTHBROOK, ILL.

POSITION WANTED

Young man with New York State Grade II A (also qualified for I B), Water Treatment & Purification License, who desires a position with city, town or community which would make rural or country living possible.

Instructed in all types of water treatment which includes experience in Rapid Filtration, Cogulation & Chlorination.

Graduated from High School with 1 year of college. Presently operating foreman in plant supplying over 100,000 population.

Reply to Box 7200, Water & Sewage Works, 185 N. Wabash Ave., Chicago 1, Illinois.

FOR SALE

EIMCO FILTER COMPLETE

Practically

Brand New

Geilich Tanning Co.

Taunton, Mass.

FOR SALE

Used Sewage Plant Equipment

1—4" Chicago Pump Company sludge pump, 2—6" Chicago Pump Company vertical shaft flood pumps, 2—6x6 Pottstown blowers, 1—8x5½ Pottstown blower, 2—10" Chicago Pump Company comminutors, 1—Horsburgh & Scott worm gear speed reducer, ratio 800:1, 1—manual clutch system used to drive 2 sets sludge collectors, 2 Worthington V-belt sheaves, 8-C, 24" & 11" p.d., 1—Airmaze air suction filter, 1—AAF 16" dia. x 6" th. dry type air filter, 2—8"x10" F-M irrigation pumps w/30 hp motors used slightly for water diversion during construction. All very reasonable. Contact Markwell and Hartz, Contractors, Box 6225, Memphis 11, Tennessee.

SANITARY ENGINEER

Twelve years experience—sales, engineering, management. Desires position in sales, sales promotion, marketing. Prefer Middle Atlantic States. Box 7600, Water & Sewage Works, 185 No. Wabash Ave., Chicago, Ill.

New Bulletins

CONTINUED FROM PAGE 107A

Brochure on Steel Storage Tanks

344

Steel Plate Fabricators Association, Chicago, Ill., have recently issued an 8-page brochure that portrays the use of steel tanks for the storage of water for communities and large industry.

The booklet explains the main features of steel for this application and shows pictures of various steel water storage tanks in usage.

Circuit Breakers in Molded Cases

345

General Electric Company, Plainville, Conn., has published a new bulletin presenting various data on their types TE, TEF and TJL molded case circuit breakers.

The publication provides complete selection data, application of the units, ordering information, pictures and tables, and outline drawings of the units and their components. A list of accessory equipment is also included.

Stationery Compressor with Semi-Radial Construction

346

Joy Manufacturing Company, Pittsburgh, Pennsylvania has just released a completely new, 24-page bulletin describing the WN-114 stationery compressor. The booklet includes specifications on three basic models of the semi-radially constructed units have a performance ranging from 1385 cfm to 1948 cfm at 125 psi.

Essential information on "package" design, components, intercooling, lubrication, motor mountings and accessories are illustrated and explained in detail.

UNUSUAL SALES OPPORTUNITY WITH CENTRILINE CORPORATION

Medium sized, fast growing, Eastern company in Water, Sewage and Industrial specialty construction in pipeline field needs an experienced and mature sales representative in the Chicago area to contact municipalities, consulting engineers and private industry in six or seven states. Area is already producing. Right man to become District Manager. Background should include engineering, sales and construction. Acquaintance with Water Utility personnel valuable. Good base salary and commission plus expenses for man who can take over territory. Reply with resume of past record to Vice President, Sales, Centriline Corporation, 140 Cedar Street, New York 6, N. Y.

WANTED—Utility District Engineer. South Tahoe Public Utility District, Bijou, California, is accepting applications for position of District Engineer. Applicant must have degree in Civil Engineering from a registered college and must be a registered civil engineer in the state of California or eligible for licensing. Applicant must have experience in sewerage systems and sewage treatment. Duties will include supervision of the maintenance, operation, and construction of water and sewerage systems, including a new 2.5 MGD activated sludge sewage treatment plant. Excellent opportunity in a rapidly expanding area. Submit complete resume of experience, etc., to South Tahoe Public Utility District, Bijou, California.

POSITION WANTED

Middle age man (44), with Georgia class "B" sewage certificate, qualified for Class "A", with high school education, numerous short schools, nine years with present employer as Supv. Water & Sewage. Desires position as Supt. Water & Sewage with municipality not over 30,000 population, preferably in South or Southwest. Box 7800, Water & Sewage Works, 185 N. Wabash Ave., Chicago 1, Illinois.

WATER UTILITY MANAGER—Exceptional opportunity for man with experience in water utility operation. College degree and administrative ability essential. Will be responsible for all operations in his district, reporting to Vice President. Location—Chicago area. Send complete resume of experience to Box 7400, Water & Sewage Works, 185 N. Wabash Ave., Chicago, Ill.

Consulting Engineers *IN WATER & SEWAGE WORKS*

ALBRIGHT & FRIEL INC.
Consulting Engineers
Water, Sewage, Industrial Wastes and Incineration Problems—City Planning, Highways, Bridges and Airports—Dams, Flood Control, Industrial Buildings—Investigations, Reports, Appraisals and Rates—Laboratory for Chemical & Bacteriological Analyses—Complete Service on Design and Supervision of Construction.
Three Penn Center Plaza
Philadelphia 2, Pa.

Bowe, Albertson & Associates
Engineers
Water and Sewage Works
Industrial Wastes
Refuse Disposal
Valuations
• Laboratory Service
75 West St. — New York 6, N.Y.
1000 Farmington Ave. — West Hartford 7, Conn.

CAPITOL ENGINEERING CORPORATION
Engineers—Constructors—Management
SEWAGE SYSTEMS — Designs and Surveys, Planning, Bridges
WATER WORKS — Roads and Streets, Airports, Dams
Executive Offices
DILLSBURG, PENNSYLVANIA

Alvord, Burdick & Howson
Engineers
Water Works, Water Purification, Flood Relief, Sewerage, Sewage Disposal, Drainage, Appraisals, Power Generation
20 N. Wacker Drive. — Chicago 6, Ill.

BOYLE ENGINEERING
Consulting Engineers
Water—Sewers—Streets
Structures—Surveys
Reports—Special Districts
331 Spurgeon Bldg. — Santa Ana, Calif.
3913 Ohio, Rm. 200 — San Diego 4, Calif.

The Chester Engineers
Water Supply and Purification—Sewage and Industrial Waste Treatment—Power Plants—Incineration—Gas Systems—Valuations—Rates—Management—Laboratory—City Planning
501 Suisman Street
Pittsburgh 12, Penna.

JOHN J. BAFFA
Consulting Engineer
Water Supply and Treatment
Sewerage and Sewage Treatment
75 West Street — New York 6, N. Y.

Brockway, Weber & Brockway Engineers
INCORPORATED
George S. Brockway — George B. Brockway — Ray E. Weber
STAFF
H. L. Fitzgerald, Robert E. Owen, Thomas A. Clark, Charles A. Anderson
Ben E. Whittington, Ernest L. Greene, Thomas B. Dunsery, Tom G. Lively
Civil, Structural, Sanitary, Municipal, Electrical, Land Planning
West Palm Beach, Florida — Ft. Pierce, Florida

CHAS W. COLE & SON
Engineers and Architects
3600 E. Jefferson Blvd.
South Bend, Indiana
2112 W. Jefferson St.
Joliet, Illinois

MICHAEL BAKER, JR., INC.
The Baker Engineers
Civil Engineers, Planners, and Surveyors
Airports, Highways, Sewage Disposal Systems, Water Works Design and Operation—City Planning—Municipal Engineering—All types of Surveys
Home Office: Rochester, Pa.
Branch Offices:
Jackson, Miss. — Harrisburg, Pa.

Buck, Seifert and Jost
Consulting Engineers
Water Supply, Sewage Disposal, Hydraulic Developments, Reports, Investigations, Valuations, Rates, Design Construction Operation Management, Chemical and Biological Laboratories
112 East 19th St. — New York

CONSOER, TOWNSEND & ASSOCIATES
—CONSULTING ENGINEERS—
Sewage treatment, sewers, storm drainage, flood control—Water supply and treatment—Highway and bridges—Airports—Urban renewal—Electric and gas transmission lines—Rate studies, surveys and valuations—Industrial and institutional buildings.
360 East Grand Avenue, Chicago 11, Illinois

Betz Laboratories, Inc.
CONSULTING ENGINEERS
INDUSTRIAL WASTE
INDUSTRIAL WATER
ANALYSIS — DESIGN
INVESTIGATIONS — OPERATION
Gillingham & Worth Sts.
Philadelphia 24, Pa.

BURGESS & NIPLE
Civil and Sanitary Engineers
Water Supply and Purification
Sewerage and Sewage Treatment
Appraisals, Reports, Valuations
2015 West Fifth Avenue
Columbus 12, Ohio

CARL C. CRANE, Inc.
CONSULTING ENGINEERS
2702 MONROE ST.
MADISON 5, WISCONSIN

BLACK & VEATCH
Consulting Engineers
Sewage—Waste Disposal—Water
Electricity—Industry
Reports, Design, Supervision of Construction, Investigations, Valuations and Rates
1500 Meadow Lake Parkway
Kansas City 14, Missouri

BURNS & McDONNELL
Engineers—Architects—Consultants
4600 E. 63rd St. Trafficway
Kansas City 41, Missouri

CRAWFORD, MURPHY & TILLY
Consulting Engineers
Water Works—Impounding Reservoirs
Highways—Municipal Streets—Expressways
Traffic Problems—Airports—Swimming Pools
Sewers—Sewage Treatment—Wastes Treatment
Storm Drainage—Flood Control—Surveys & Reports
LAKESIDE 8-5619
755 So. Grand Ave., W. — SPRINGFIELD, ILL.

CLINTON BOGERT ENGINEERS
CONSULTANTS
Clinton L. Bogert, Donald M. Dilmars, Charles A. Manganaro
Ivan L. Bogert, Robert A. Lincoln, William Martin
Water & Sewage Works • Incinerators
Drainage • Flood Control
Highway and Bridges • Airfields
145 East 32nd Street, New York 16, N. Y.

Camp, Dresser & McKee
Consulting Engineers
18 Tremont Street, Boston 8, Mass.
Water Works and Water Treatment; Sewerage and Sewage Treatment; Municipal and Industrial Wastes; Investigations and Reports; Design and Supervision; Research and Development; Flood Control.

ROY B. EVERSON
Water Treatment Service Since 1900 for Swimming Pool Circulating Systems. Purification Systems as applied to Sewage Treatment and Water Works. A New System for Automatic Control.
233 W. Huron Street, Chicago 10, Ill.

Additional Engineers Cards on Next Page

ENGINEER ASSOCIATES
Consulting Engineers
Sewage Disposal Systems, Water Works Design, Airports, Highways and Bridges, City Planning & Engineering for Building Design
312 N. W. Eighth St.
Evansville, Indiana

HAVENS AND EMERSON
A. A. BURGER — H. H. MOSELEY
J. W. AVERY — F. S. PALOCSAY
E. S. ORDWAY — G. H. ABPLANALP
A. M. MOCK — S. H. SUTTON
CONSULTING ENGINEERS
WATER, SEWERAGE, GARBAGE, INDUSTRIAL WASTES VALUATIONS—LABORATORIES
LEADER BLDG. CLEVELAND 14, O.
WOOLWORTH BLDG. NEW YORK 7, N. Y.

LOCKWOOD GREENE ENGINEERS, INC.
Architects - Engineers
Montgomery Building
SPARTANBURG, S. C.
Water Supply—Power Plants
Sewage Disposal—Valuations & Appraisals
Industrial Waste—Industrial Plant Design

FAY, SPOFFORD & THORNDIKE, INC.
Engineers
Water Supply and Distribution — Drainage
Sewerage and Sewage Treatment
Airports — Bridges — Express Highways
Port and Terminal Works — Industrial Plants
Investigations, Reports, Designs, Valuations
Supervision of Construction
11 BEACON STREET, BOSTON 8, MASS.

Hayden, Harding & Buchanan, Inc.
Consulting Engineers
John L. Hayden
John H. Harding — Oscar J. Compto
Waterworks, Sewerage, Civil, Mechanical, Electrical, Structural
1340 Soldiers Field Road, Boston 35, Mass.

LOZIER CONSULTANTS, INC.
Sewerage, Sewage Disposal, Water Supply, Water Purification
Refuse Disposal
Engineers
10 Gibbs Street — Rochester 4, N. Y.

FINKBEINER, PETTIS & STROUT
CONSULTING ENGINEERS
Water Supply, Water Treatment,
Sewerage, Sewage Treatment,
Bridges, Highways & Expressways
2130 Madison Avenue — Toledo 2, Ohio

HAZEN AND SAWYER
ENGINEERS
Richard Hazen — Alfred W. Sawyer
H. E. Hudson, Jr.
Water and Sewage Works
Industrial Waste Disposal
Drainage and Flood Control
360 Lexington Ave., New York 17, N. Y.

Metcalf & Eddy
Engineers
Water, Sewage, Drainage, Refuse and Industrial Waste Problems
Airports — Valuations
Laboratory
Statler Building, Boston 16

Freese, Nichols & Endress
Consulting Engineers
407 Daniger Building
Fort Worth, Texas

Henningson, Durham & Richardson
Engineers • Architects • Planners • Consultants
ENGINEERING SINCE 1917
Reports, Planning, Appraisals, Architectural Design, Highways, Bridges, Streets, Airports, Sewerage, Waterworks, Power Plants, Electrical Systems, Natural Gas Systems, Industrial Design
OMAHA COLORADO SPRINGS PHOENIX

O'BRIEN & GERE
Consulting Engineers
Water Supply, Treatment and Distribution
Sewerage and Sewage Treatment
Industrial Waste Treatment—Flood Control and Drainage—Rate Studies
400 East Genesee Street — Syracuse 2, N. Y.

GANNETT FLEMING CORDDRY & CARPENTER, Inc.
ENGINEERS
Dams, Water Works, Sewage, Industrial Wastes & Garbage Disposal, Highways, Bridges & Airports — Traffic & Parking Appraisals, Investigations & Reports
HARRISBURG, PA.
PITTSBURGH, PA. PHILADELPHIA, PA.
DAYTONA BEACH, FLA.

The Jennings-Lawrence Co.
Civil & Municipal Engineers
Consultants
Water Supply, Treatment & Distribution
Sewers & Sewage Treatment
Reports—Design—Construction
1392 King Ave. — Columbus 12, Ohio

PARSONS, BRINCKERHOFF QUADE & DOUGLAS
Civil and Sanitary Engineers
Water, Sewage, Drainage and Industrial Waste Problems.
Structures—Power—Transportation
165 Broadway — New York 6, N. Y.

GILBERT ASSOCIATES, INC.
Engineers and Consultants
Water Supply and Purification
Sewage and Industrial Waste Treatment
Chemical Laboratory Service
Investigations and Reports
New York — Reading, Pa. — Washington
Houston — Philadelphia

Jones, Henry & Williams
Consulting Sanitary Engineers
Water Works
Sewerage & Treatment
Waste Disposal
2000 West Central Ave. — Toledo 6, Ohio

MALCOLM PIRNIE ENGINEERS
Malcolm Pirnie — Ernest W. Whitlock
Robert D. Mitchell — Carl A. Arenander
Malcolm Pirnie, Jr.
MUNICIPAL AND INDUSTRIAL
Water Supply—Water Treatment
Sewage and Waste Treatment
Drainage—Sewerage—Refuse Disposal
25 West 43rd St. — New York 36, N. Y.

GREELEY AND HANSEN
Engineers
Samuel A. Greeley — Paul Hansen (1920-1944)
Paul E. Langdon — Kenneth V. Hill
Thomas M. Niles — Samuel M. Clarke
Water Supply, Water Purification
Sewerage, Sewage Treatment
Flood Control, Drainage, Refuse Disposal
14 East Jackson Blvd., Chicago 4

KENNEDY ENGINEERS
SANITARY ENGINEERING
LOS ANGELES—SALT LAKE CITY
TACOMA—SAN FRANCISCO

THE PITOMETER ASSOCIATES, INC.
Engineers
Water Waste Surveys
Trunk Main Surveys
Water Distribution Studies
Water Measurements & Special Hydraulic Investigations
New York, 50 Church Street

HASKINS, RIDDLE & SHARP
Consulting Engineers
Water—Sewage & Industrial Wastes—Hydraulics
Reports, Design, Supervision of Construction
Appraisals, Valuations, Rate Studies
1009 Baltimore Ave. — Kansas City 5, Mo.

Morris Knowles, Inc.
Engineers
Water Supply and Purification, Sewerage and Sewage Disposal Valuations, Laboratory, City Planning
1312 Park Building, Pittsburgh, Pa.

LEE T. PURCELL
Consulting Engineers
Water Supply & Purification; Sewerage & Sewage Disposal; Industrial Wastes; Investigations & Reports; Design; Supervision of Construction & Operation
Analytical Laboratories
38 De Grasse Street — Paterson 1, N. J.

Additional Engineers Cards on Next Page

Rader and Associates
Engineers and Architects
Water Works, Sewers, Refuse Disposal and Other Public Works Engineering Reports. Investigations, Consultations, Plans, Specifications and Supervision of Construction Work
100 Biscayne Blvd. South, Miami 32, Fla.

STANLEY ENGINEERING COMPANY
Consulting Engineers
Hershey Building — **208 S. LaSalle St.**
Muscatine, Iowa — **Chicago 4, Ill.**
1154 Hanna Building
Cleveland 15, Ohio

Weston & Sampson
Water Supply, Water Purification, Sewerage, Sewage and Industrial Waste Treatment, Corrosion Control, Laboratory Service Supervision, Valuations
14 Beacon St. — **Boston, Mass.**

Thomas M. Riddick
Consulting Engineer and Chemist
Municipal and Industrial Water Purification Sewage Treatment, Plant Supervision, Stream Pollution Investigations, Chemical and Bacteriological Analyses.
360 East 149th Street
New York 55, N. Y.

Alden E. Stilson & Associates
Limited
Consulting Engineers
Water Supply—Sewage—Waste Disposal
Bridges—Highways—Industrial Buildings
Studies—Surveys—Reports
75 Public Square, Cleveland 13, Ohio
245 North High Street, Columbus 15, Ohio

Whitman & Howard
Engineers (Est. 1869)
Water Supply, Water Purification, Sewerage, Sewage Disposal, Water Front Improvements and all Municipal and Industrial Development Problems. Investigations, Reports, Designs, Supervision, Valuations.
89 Broad St., Boston, Mass.

ROBERT AND COMPANY
ASSOCIATES
Engineering Division
ATLANTA

SWINDELL-DRESSLER CORP.
Consulting Engineers
Industrial Plants—Waterworks
Sewer Systems—Highways—Dams
Bridges—Surveys—Reports
Design and Construction Supervision
Box 1888 • **Pittsburgh 30, Pa.**

WHITMAN, REQUARDT & ASSOCIATES
Engineers—Consultants
Civil—Sanitary—Structural—
Mechanical—Electrical
Reports, Plans, Supervision, Appraisals
1304 St. Paul Street
Baltimore 2, Maryland

Benjamin L. Smith & Associates
Engineers
Investigations—Reports
Designs—Supervision—Valuations
Municipal Engineering and Public Utilities
11 North Pearl Street
Albany 7, New York

Leonard S. Wegman Co.
Consulting Engineers
Refuse Disposal, Water Supply, Sewage Collection & Treatment, Highways, Bridges, Special Structures, Shore Erosion & Waterfront Works
235 East 45th Street New York 17, N. Y.

K. G. Woodward & Associates
CONSULTING ENGINEER
CIVIL AND SANITARY ENGINEERING
WATER SUPPLY AND DISTRIBUTION
SEWERS AND SEWAGE TREATMENT
INDUSTRIAL WASTE DISPOSAL
INVESTIGATIONS AND REPORTS
PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION
SUPERVISION OF OPERATION
13 East Main Street, Webster, New York

going to cleveland?

the "downtown" location for businessmen, group meetings, or vacationists is at East 6th & St. Clair Avenue.

• Family rates • 3 fine restaurants • AAA recommended • garage & Parking lot adjacent • closest to the Stadium & public auditorium

from $5.50

William T. Lanham
Gen. Mgr.

CH 1-5100

CALIFORNIA'S
welcome to the world

Miramar
and NEW TOWER

California's World-Famous Resort overlooking the Blue Pacific where Wilshire meets the sea. Twenty minutes from International Airport. 450 luxurious rooms and bungalows, all with television and radio. Complete convention facilities. Banquet rooms for up to 2,000, air-conditioned. Exciting new Venetian Room and Cantonese Room. Swimming pool. Beautiful grounds and landscaped gardens. Rates from $8.

Write William W. Donnelly, Gen. Mgr.

Across the U.S.A. and in HAWAII
MASSAGLIA
CREST OF GOOD LIVING
JOSEPH MASSAGLIA, JR., President

MASSAGLIA HOTELS
- SANTA MONICA, CALIF. Hotel Miramar
- SAN JOSE, CALIF. Hotel Sainte Claire
- LONG BEACH, CALIF. Hotel Wilton
- GALLUP, N.M. Hotel El Rancho
- ALBUQUERQUE, Hotel Franciscan
- DENVER, COLO. Hotel Park Lane
- WASHINGTON, D.C. Hotel Raleigh
- HARTFORD, CONN. Hotel Bond
- PITTSBURGH, PA. Hotel Sherwyn
- CINCINNATI, O. Hotel Sinton
- HONOLULU Hotel Waikiki Biltmore

World-famed hotels
Teletype service—Family Plan

Atlantic City's Newest Convention Hotel

The Jefferson with its new facilities for handling all convention groups is fast becoming Atlantic City's most popular convention hotel.

The Jefferson features an abundance of Meeting, Banquet and Exhibition Rooms fully equipped to handle your every need. Experienced personnel. Location ideal in heart of Atlantic City.

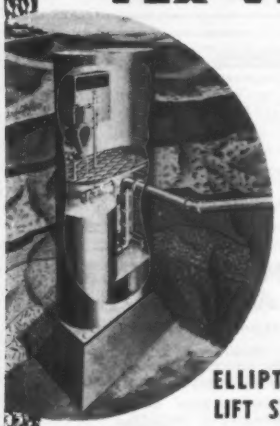
WRITE • PHONE • WIRE TODAY
FOR DESCRIPTIVE LITERATURE

Convention Manager
Hotel Jefferson
Atlantic City, N. J.

Now...

FROM

TEX-VIT



ELLIPTO-JECT LIFT STATION

AN ADVANCED CONCEPT IN PNEUMATIC EJECTOR STATIONS

EXCLUSIVE SHELL WITHIN-A-SHELL DESIGN

Elliptical-shaped outer shell completely encloses the air storage tank and sewage receiver of this simplex sewage ejector station. This unique design provides maximum protection for all components — plus easier maintenance and modification. Any component can be removed and replaced without removing the outer shell.

SUPERIOR COMPONENTS FOR EXTRA DEPENDABILITY

Brand names of motors, compressors, controls, and other Ellipto-Ject components are among the most dependable in American industry. You know you are getting the best when you specify Ellipto-Ject.

INSTALLATION TESTED AND PROVEN

Ellipto-Ject pneumatic ejector stations are setting new standards. Names of municipal and industrial users on request.

Let Tex-Vit help with all your sewage lift problems. Tex-Vit also manufactures Delta-Ject, a duplex station incorporating the same design principles as the Ellipto-Ject. Other Tex-Vit products include pneumatic ejectors and packaged pump stations.

Write for Bulletin No. EJ-60

TEX-VIT SUPPLY COMPANY

MANUFACTURING DIVISION

Dept. W3, Box 117, Mineral Wells, Texas

Advertisers Index

A

*Allis Chalmers 33A-35A
*Amercoat Corp. 37A
American Hard Rubber Co. 51A
Aurora Pump Div. 23A
Automatic Control Co. 19A

B

Badger Meter Mfg. Co. 36A
*B-I-F Industries, Inc. ..... Back Cover
Buffalo Meter Co. 18A
Builders Providence, Inc. ..... Back Cover

C

Cast Iron Pipe Research Ass'n. 20A-21A
*Chicago Pump Company 6A
Cleveland Trencher Co. 1A
*Clow & Sons, Jas. B. 4A
Consulting Engineers 109A-110A-111A

D

Darling Valve & Pump Mfg. Co. 44A
Dean & Co., Payne 107A

E

Eddy Valve Co. 4A
Ellis & Ford Mfg. Co. 106A

F

*Fischer & Porter Co. 2A
Ford Meter Box Co. 34A

H

*Hamilton-Kent Mfg. Co. 26A
*Hardinge, Inc. 15A
Healy-Ruff Company 99A
Hersey-Sparling Meter Co. 12A
Hooker Chemical Corp. 101A

I

*Infilco Inc. 48A
Industrial Chemical Sales 27A
*International Minerals & Chem. Corp. 14A

K

Keasbey & Mattison 24A-25A

L

Lemi Torque Corp. 28A
*Leopold & Co., F. B 16A
Leopold & Stevens Instr. Inc. 31A
Lock Joint Pipe Co. ..... Inside Front Cover

M

*M & H Valve & Fittings Co. 32A
*Mueller Company ..... 49A-Inside Back Cover
*Multiplex Mfg. Co. 104A

N

National Welding Co., Ltd. 30A
*Neptune Meter Company 52A

O

Oliver Corporation 39A

P

*Pacific Flush Tank Company 8A
Phelps Dodge Ref. Corp. 40A
Philadelphia Gear Corp. 28A
*Philadelphia Quartz Co. 107A
*Phipps Bird, Inc. 106A
Precision Scientific Co. 106A
*Pratt Co., Henry 99A
*Preload Co. 105A
Price Bros. 38A
*Pressure Concrete Co. 104A

R

*Roberts Filter Co. 106A
*Roots Connersville Blower 41A

S

*Smith & Loveless 29A
Sparling-Hersey Meter Co. 22A
Synchro-Start Products, Inc. 102A
System Analyzer Co. 5A

T

Tex-Vit Supply Co. 112A

U

U. S. Rubber 45A

W

*Walker Process Equip. 46A
*Wallace & Tierman, Inc. 43A
*Waukesha Motor Co. 50A
Wedge-Lock Clay Pipe 47A
Wood Co., R. D. 42A

Y

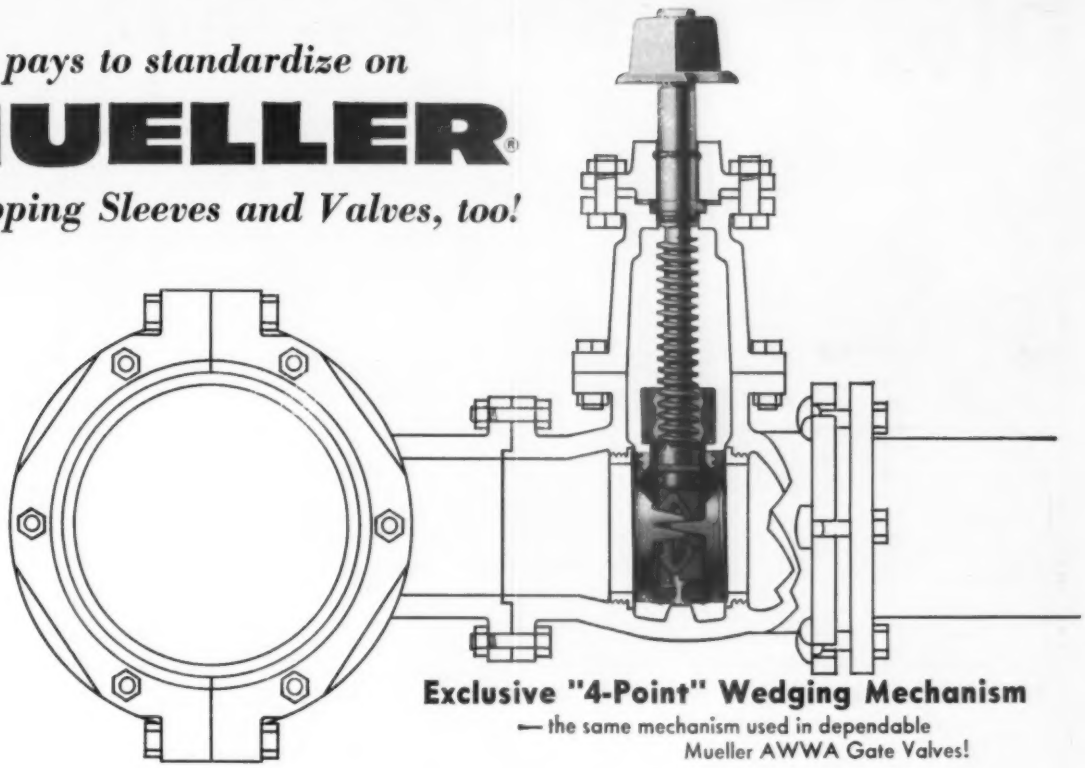
*Yeomans Bros. Co. 17A

*Advertisers represented in the 1959 Reference Number with Catalog specifications copy. Please refer to that issue for additional information concerning their product or equipment.

it pays to standardize on

MUELLER®

Tapping Sleeves and Valves, too!



Exclusive "4-Point" Wedging Mechanism

— the same mechanism used in dependable Mueller AWWA Gate Valves!

Save time and money by specifying "quality-matched" Mueller Tapping Sleeves and Valves throughout your system.

Laterals and branch main connections may be made quickly and easily with unskilled labor under full line pressure and with no loss of water.

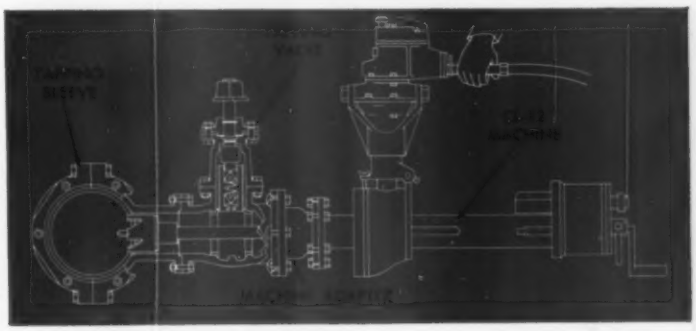
The extra long length and heavy cross sections of all Mueller Tapping Sleeves actually strengthens the main at the lateral connection. Mechanical joints or calked joints permit rapid pressure-tight installations. Just two sets of end gaskets readily adapt a nominal size of mechanical joint sleeve to all classes of cast iron pipe regularly used.

Smaller inventories, gained storage space and easier maintenance are yours if you've also standardized on job-proven Mueller Gate Valves. The wedging mechanism of non-rising-stem Mueller Tapping Valves is identical to that of Mueller AWWA Gate Valves. In fact, the parts are completely interchangeable! "O" ring stem seals or conventional packing are also available.

Mechanical joint and calked type sleeves and valves are available in a full range of main and branch main sizes.

Write for complete information and specifications on Mueller's full line of Tapping Sleeves and Valves.

Use the Mueller CL-12 Drilling Machine to install Tapping Sleeves and Valves faster than ever before.



These are just a few of the bonus features found in all "quality-matched" Mueller products for water distribution systems. Add up these features and you'll see why so many cities and towns have "standardized on Mueller."

MUELLER CO.

DECATUR, ILL.

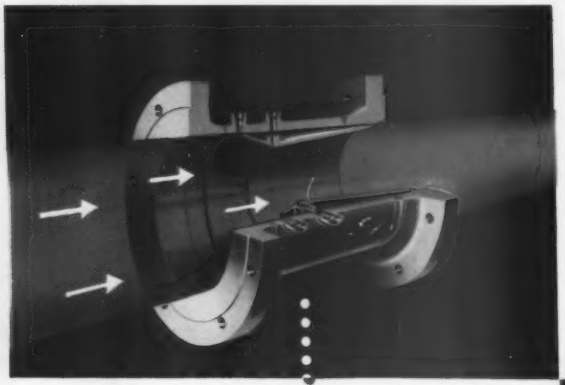
Factories at: Decatur, Chattanooga, Los Angeles
In Canada: Mueller, Limited; Sarnia, Ontario

POSITIVE CONTROL OF MATERIALS IN MOTION BIF METERS FEEDERS CONTROLS

B-I-F COMPATIBLE COMPONENTS . . .

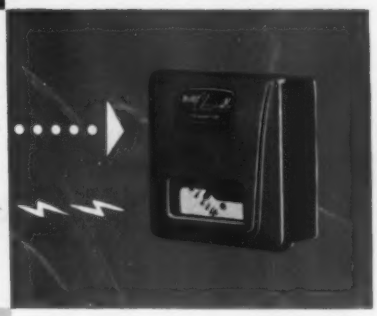
increase efficiency and accuracy in

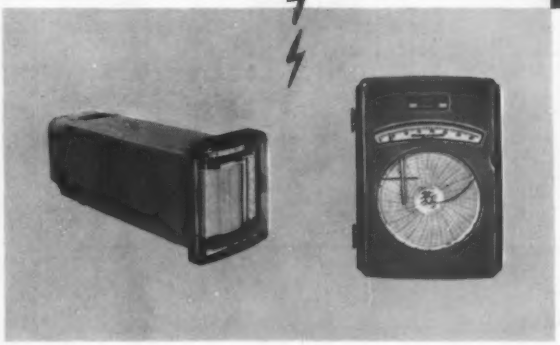
INTEGRATED TELEMETERING SYSTEMS!



BIF *Builders-Providence* time-duration telemetering systems . . . primaries, transmitters and receivers specifically designed and teamed for better measurement and control of

- flows
- pressures
- temperatures
- levels
- positions
- weights
- electrical quantities





Primaries . . . most complete line available . . . Venturi Tubes for highest accuracy, Dall Flow Tubes for minimum head loss, and wide selection of special tubes and nozzles to suit any requirement.

Transmitters . . . many Chronoflo types . . . individually designed to transmit flow, level, pressure, electrical quantities, temperature or similar functions over long distances.

Receivers . . . new modular construction permits building-block type assembly of unitized plug-in components for greater reliability, high enduring accuracy, high speed operation, high repeatability, and greater versatility.

B-I-F *Industries*

BUILDERS-PROVIDENCE • PROPORTIONEERS • OMEGA

METERS • FEEDERS • CONTROLS / CONTINUOUS PROCESS ENGINEERING

Remember . . . B-I-F offers single responsibility for complete systems. For full details, request literature TH-MS, free of charge. Write on company letterhead for B-I-F's new 52 Page Telemetering Handbook available at $2.00 per copy.

B-I-F Industries, Inc., 350 Harris Ave., Providence 1, R. I.